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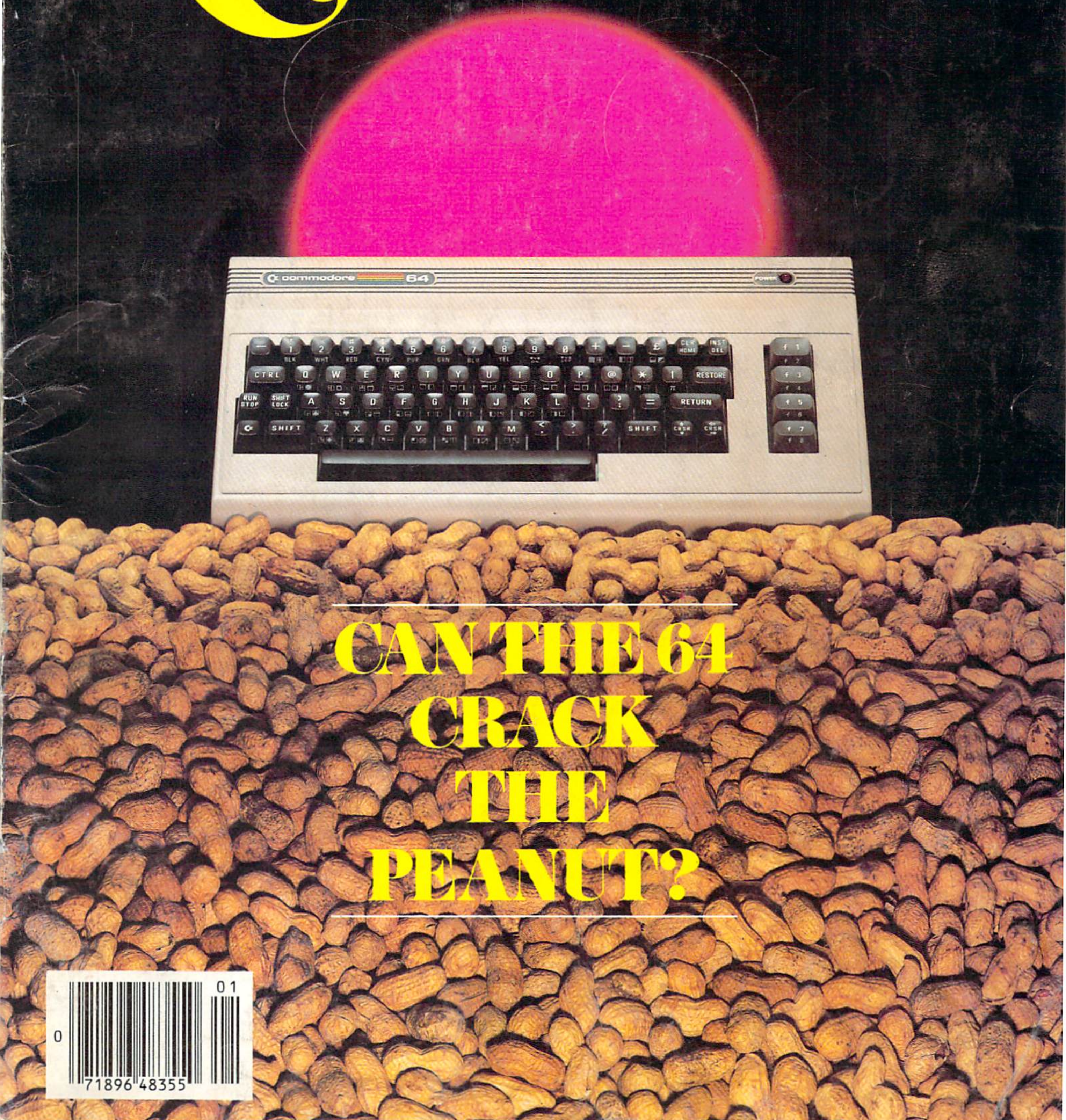
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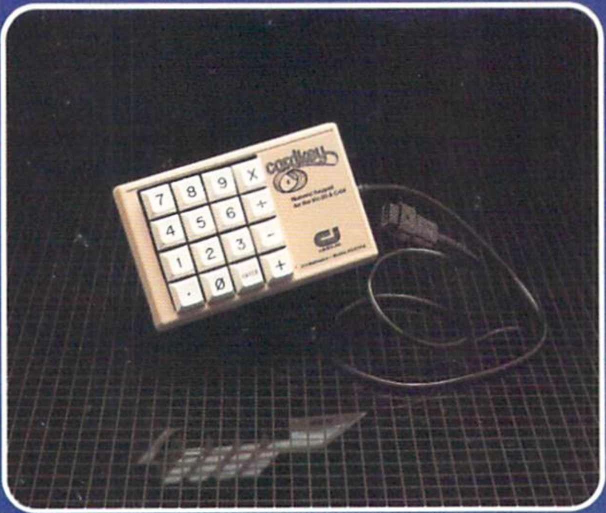
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Ahoy!

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AHOY! No. 1 January 1984 is published monthly by Ion International Inc., 45 W. 34th St. Room 407, New York, NY, 10001. Subscription rate: 12 issues for $15 and 24 issues for $28. Canada $19 and $36 respectively. Application to mail at 2nd Class postage rates is pending at New York, NY and additional mailing offices.

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Reader Service No. 2

EDITORIAL

And a Little Child Shall Lead Them

As the owner (or prospective owner) of a Commodore 64 microcomputer, you are part of a revolution.

You don't feel like a revolutionary? Perhaps that's because the microcomputer revolution is not the kind of violent upheaval that we usually associate with the word. No bloody battles, no barricades in the streets, no marches or speeches by charismatic leaders. The microcomputer revolution is peaceful, benign, happy. Maybe that's because it is being led by children.

Children? At the head of a revolution?

Yes indeed. The microcomputer revolution is, in its beeping, blinking, electronic way, a fulfillment of the Biblical prophecy that "a little child shall lead them." If it weren't for children, this revolution might never have gotten started. And, let's face it, microcomputers bring out the child in all of us: the thrill of learning something new, of achieving skills and abilities that we did not have before, the excitement of adventure, the sense of wonder that most adults seem to lose somewhere between their teen years and their thirtieth birthday.

Children did not create the microcomputer, even though many of the leading developers of today's fast-paced industry are barely out of their teens. The origins of the digital computer go back more than a century to the English mathematician Charles Babbage, who tried to build a mechanical "analytical engine" that incorporated many of the features of modern computers. But Babbage had to work with mechanical cogs and wheels; electrical machinery did not exist yet. He failed to make his "engine" work, and died a bitter man.

He was a century ahead of his time. It was not until the war-torn 1940s that electronic computers came into being: bulky, balky roomsful of massive consoles that needed huge amounts of electricity to feed them and cooling water to dissipate the heat generated by their vacuum tubes. In the 1960s the swing to transistors began, and computers became smaller, faster, smarter, and cheaper.

By the early 1970s, desk-sized minicomputers were invading business offices and really far-out futurists were predicting that someday computers would even be used in the home. Most of the experts laughed at that; home computers were a *long* way off, they claimed. Why, people are afraid of computers! You have to be some kind of superbrain to use them! A new word, *programmer,* entered the language, and the experts worried deeply about the "dehumanizing" effects that computers would have on people. What they did not take into account was the children.

The kids weren't afraid of computers. They didn't feel dehumanized when they tinkered with a keyboard. They took to programming as easily as they take to swimming or ice cream.

It started with videogames. They hit the American public like a whirlwind. It was the demand for videogames that sparked the development of microcomputers, that established the home computer/personal computer market. The child in us, the little kid that's delighted by *Space Invaders* or *Pac-Man* created a market that accounted for nearly $10 billion in sales last year.

With that kind of a push, the microcomputer market exploded into the American economy. While the older, mature industries which had been the bellwether of the nation's economy—steel, automobiles, construction—faltered and stumbled into a Recession, microcomputers and their associated electronic marvels became the new leaders of American industry. In 1982, for the first time in history, jobs in the service sector of the economy (which mainly involve information handling) outnumbered jobs in manufacturing.

Computer technology has advanced with breathtaking speed: if automobiles had improved their efficiency and cost as rapidly as computers have over the past twenty years, a Rolls Royce would be able to get more than a hundred miles per gallon of gas, and would cost less than $100.

And this revolution has barely started. Microcomputers are so new that most of us can't even guess at what they'll be able to do next. Which is why this magazine has been created. Month after month, *Ahoy!* will provide you the latest news of the Microcomputer Revolution, and show you how it relates to *your* Commodore 64. New hardware, new software, new ideas, new friends.

Because deep inside each of us, there is a delighted little child who is leading the way to a new world of electronic wonders. Your Commodore 64 is the key to that new world. With it, and *Ahoy!,* we can turn the Microcomputer Revolution into a new, exciting, and wondrous Children's Crusade.

—Ben Bova



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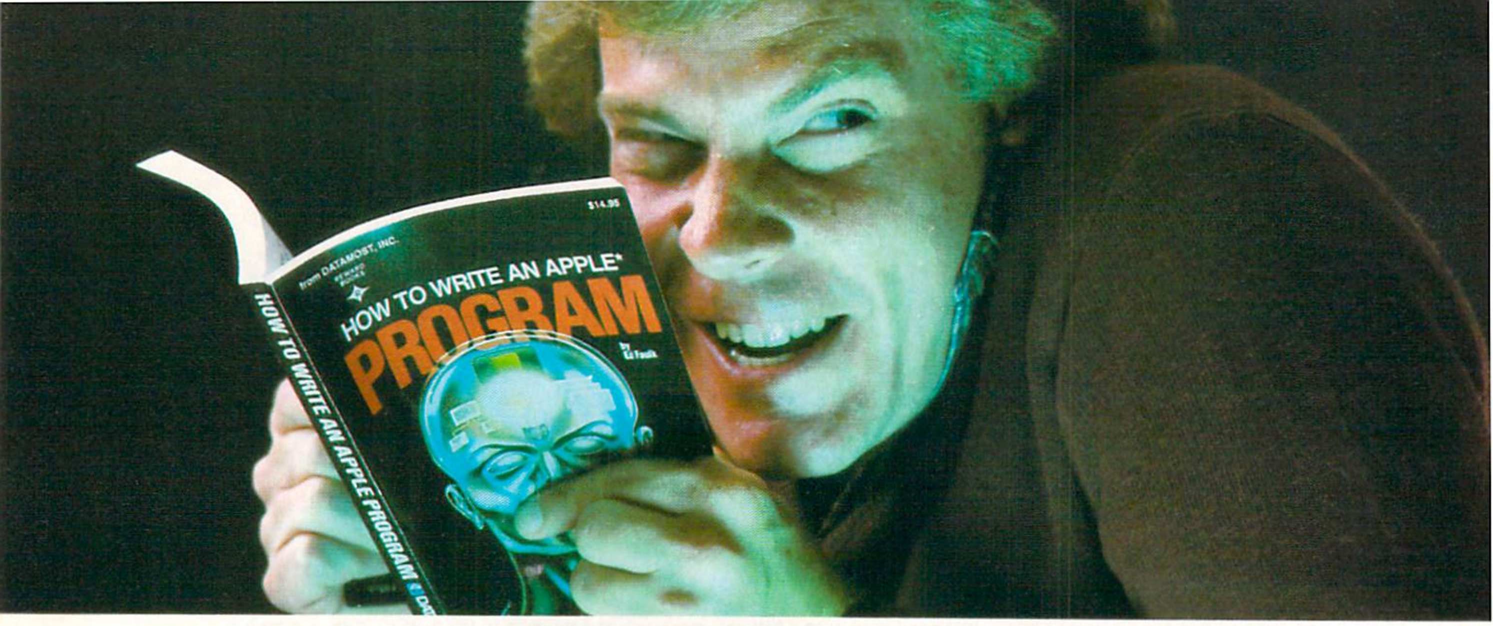
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The Executive 64

BRIEFLY

Commodore has provided one alternative for the growing number of business travelers who find their computers significantly harder to leave behind than their wives. The portable (27.6 pounds), briefcase-sized (5" x 14½" x 14½"), $995 Executive 64 features an upper and lower case detachable keyboard, 6-inch color monitor, and single floppy disk drive with 179K capacity (second drive capacity).

The system is compatible with VIC-20 and C-64 peripherals, including the VIC modem for telecommunications. A Z-80 allows the unit to accommmodate a CP/M operating system, and a PET Emulator makes it compatible with a large quantity of PET software. It can also use all the game cartridges that work with the C-64.

Built into the ROM is BASIC V2; other languages include PASAL, LOGO, COMAL, ASSEMBLER, and PILOT. The unit's 6510 central processor is 6502 program compatible.

LOW-COST PRINTERS

Alphacom Inc. has introduced two new printers, claiming that they are the most inexpensive printers available with graphics capabilities for home and personal computers.

The Alphacom 81 is an 80-column printer with a wraparound facility for printing text lines longer than 80 characters. Printing at a rate of 80 characters per second, the unit combines a single-chip microprocessor with the popular Olivetti THM-125 dot matrix thermal print mechanism. The friction feed printer has bit-mapped graphics capability and recognizes standard ASCII control codes. Suggested retail price of $169.95.

The Alphacom 42, priced at $119.95, is a forty column printer that operates at the same speed as the 81 and has many of the same features.

Interface cables are now available for the VIC 20 and Commodore 64; prices for the cables start at around $44.95. The Commodore cable plugs into the serial bus connector and allows the full character set, including continous graphics and bit-mapped graphics using BASIC software.

BUT WILL SHE OUTPUT?

A date with a Promqueen may be in the future of Commodore 64 users seeking a microprocessor development system for EPROM-resident machine language programs. The Promqueen/64, a souped-up version of the cartridge earlier introduced by Gloucester Computer for the VIC-20, utilizes the 64's greater memory space, supports an RS-232 upload/download system, and provides faster EPROM burn time of a wider variety of EPROMS, with such applications as process control, electronic game development, and music synthesis. Any computer-controlled device, according to the manufacturer, can be easily programmed or reprogrammed.

The Promqueen/64 retains all





The Alphacom 81 (left) and the Alphacom 1842 printers.

Reader Service No. 5



The Promqueen/64 is inserted into the expansion slot.



Phonetically speaking . . .

its predecessor's features (except the MIMIC code), and has a 28-pin Textool ZIF socket, 24K RAM workspace, a matrix-switch EPROM selector that accommodates all 5-volt JEDEC pinout devices, a process-burn erase check, and provisions for use of faulty EPROMS and recharging of previously programmed devices.

No personality modules are required for the unit, which reads, runs, and programs EPROMs 2716, 2516, 27C16, 1732, 1732A, 27C32, 2532, 2764, 2564, and 27128, plus future devices such as the 17256. The system also programs and erases such EPROMs as the Hitachi 4016.

Autohex/64 software, which comes with each plug-in cartridge, provides block transfer, remapping, transfer of bytes from and to marked locations, instant jumps to addresses specified in the commands, and global searches for opcodes requiring remapping during block transfer.

The Promqueen/64's $299 price includes a 60-page instruction manual and EPROM firmware for all operations. (Corsage is extra.) The unit is available directly from Gloucester Company, Inc., 1 Blackburn Center, Gloucester, MA 01930 (Telephone: 617-283-7719).

SPEAK UP!

''True to life speech'' is the keynote claim Commodore Business Machines makes for its new speech module, containing a built-in vocabulary of 235 words spoken in a female voice. Music, graphics, and speech can be programmed simultaneously, directly from Basic and/or assembler. A separate audio out connects the speech into the 64's user port, and other talking or non-talking cartridges can be inserted into a second port.

The educational applications of the module, as Commodore sees them, include alphabet learning, counting, and spelling, and on a higher level mathematics, science, and interactive foreign language programs.

Games that will work with the module include *Wizard of Wor* and *Gorf,* with more planned for release in the near future. The module can support cartridges of up to 128K bytes.

SAY WHAT?

Available from the Alien Group is a speech synthesizer that enables VIC-20 and 64 users to incorporate speech into their own programs. The *Voicebox,* retailing for $95.00, features built-in volume and pitch controls and an unlimited vocabulary potential. The model has its own speaker and plugs directly into the user's port.

Cassette-based software (disk available for 64) includes a machine-language text-to-speech program that merges with the BASIC program to allow words spelled in English to be spoken (occupying 2033 bytes); a text-to-speech program incorporating a face whose mouth moves in synch with its words (2514 bytes); instructions for using the Voicebox in BASIC programs with only a few dozen bytes of memory (special ASC11 code required); a BASIC program showcasing the Voicebox's ability to sing in tune; and a spelling quiz with a talking face, a 75-word vocabulary, and the capability of expanding that vocabulary with phonetic spelling. (13K required.)

A comprehensive music and

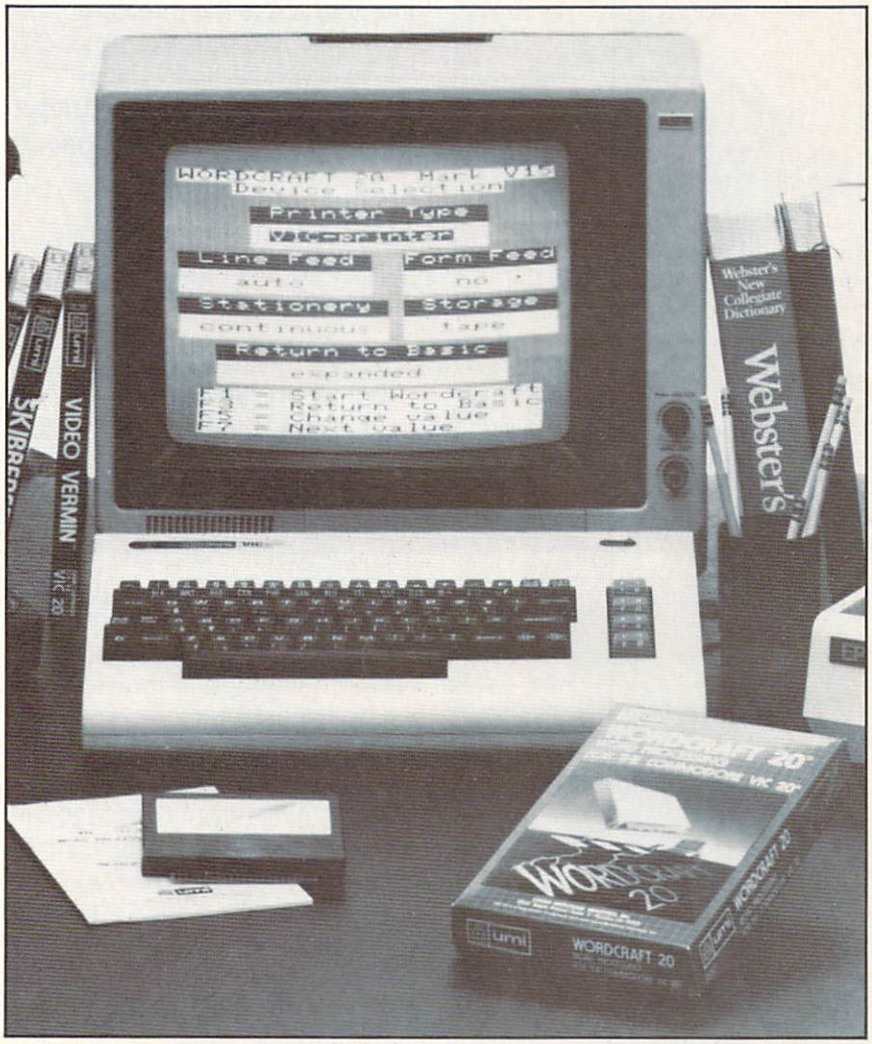
singing system, with a "human" talking or singing face, converts two rows of the 64 keyboard into a piano keyboard, thus allowing the user to enter his/her own melodies. This software incorporates the musical capabilities of the SID chip. The package also features a library of popular songs with VOICE and melodies. Price for the music and singing system is $25.00

The Alien Group is closer to home than you might think: 27 W. 23rd street, New York, N.Y. 10010.

SORCERY

"Imagine an animated, full color desk on your television screen. There's a typewriter, index file, telephone, calculator and financial journal on the desk, and a wastebasket underneath. There's also an artist's easel and a vertical file cabinet with a digital clock on top of it.

"To use any feature, use a joystick, trackball, or mouse to move a pointing finger to one of the objects on the screen. For example, to use the typewriter, move the finger to the typewriter and press the 'fire button.' The rest is magic!"



VIC-20 owners now have a word processor selection.

That's how Commodore Software President Sig Hartmann explained the new *Magic Desk* software series for the 64. The program uses no written language: all instructions and menus are pictorial, including some international symbols.

Hartmann described a typical function of the *Magic Desk:* "The picture of a scrolled sheet of paper appears at the bottom of the screen when you're using the typewriter. After typing a page, you can move the pointing finger to the scrolled sheet, pick it up and move it to the file cabinet. There are three file drawers, with ten files in each drawer and ten pages in each file. You can give the files any titles you wish, and move the pages you've typed from one file to another, or copy the pages into several files."

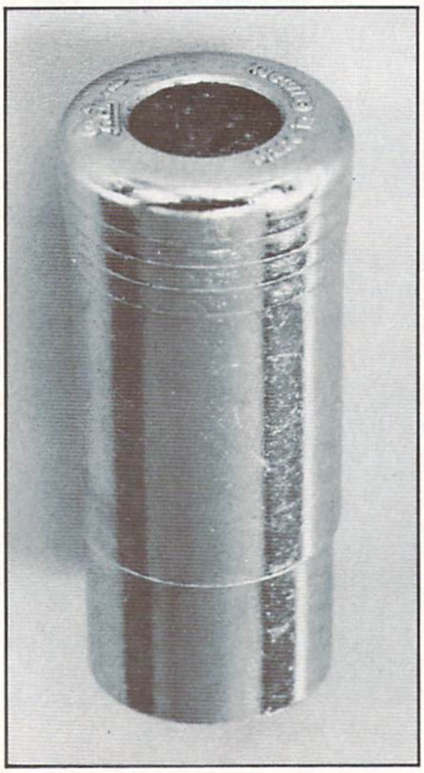
First in the *Magic Desk* series of software, scheduled for an early fall release, is *Magic Desk I-Type and File,* which activates the typewriter, index file and related editing and filing features of the desk. Retailing for under $100, it contains a 32K-byte program on ROM. Future packages, expected to be similarly priced, will provide capabilities for calculating and budgeting and have artistic and educational applications.

SWAMPING THE FOX

The *Wordcraft,* a word processor perhaps more versatile than any previously designed for the VIC-20, arrived in April from United Microware Industries, Inc. Compatible with almost any serial or parallel printer, including Commodore, Epson, NEC, Okidata, and others, the cartridge contains 16K of program on ROM chips, with an additional 8K or RAM memory available in the higher-priced *Wordcraft 20 Plus.*

Features include a page capacity of 66 lines of 99 characters, page





A boon for June (top) and Bytes & Pieces Color Sharpener (above).

width and length alteration at any time, new-page control, automatic line centering, justified or ragged margins, text highlighting, tab stops, decimal tabs, hard and soft hyphens, display color control, quick-reference chart, index, page ruler, status displays, text insertion and addition, merging, and deletion of individual characters, words, lines, paragraphs, and copy blocks.

The system also formats diskettes, forces new pages as called by text length, and provides a non-destructive file directory. Automatic return to VIC BASIC can be accomplished without removing the Wordcraft cartridge. The 8K RAM of the *Wordcraft 20 Plus* can be used by BASIC programs.

United Microware Industries, 3503-C Temple Ave., Pomona, CA 91768.

FLOPPY PENCIL

Writing off the cost of your Commodore could be made easier by *Tax Command,* a Federal Income Tax calculation program from Practical Programs. It recently entered its second year of publication, supposedly with "all known 'bugs' removed."

Compatible with the C-64 or VIC-20, the program provides line-by-line income tax calculation for federal forms (including 1040), income averaging, Schedule A-itemized deductions (including medical), capital gains and losses, and tax tables for every filing status. Additional schedules are available for the C-64 and other computers with over 48K. Suggested retail price is $24.95.

See this issue's Reviews section for a profile of another tax program, *Hometax.*

BULLETIN FROM WAUWATOSA

A company called Bytes & Pieces has produced a Color Sharpener which they claim will substantially improve the color resolution and intensity of Commodore 64 textual displays. Company spokesman Scott Walker says that the Sharpener will not completely eliminate interference that is common when the 64 is used with a TV set, but it will make letters crisper and cleaner and brighten the picture.

The Color Sharpener plugs into the monitor port; no soldering or wiring is required. Suggested retail price is $18.95.

Bytes & Pieces, 550 N. 68th Street, Wauwatosa, WI 53213.

K-RATIONS

From the memory masters at Mosaic Electronics, two new memory boards for the VIC 20 are now in release.

The RAMMaster 16 is a full service 16K RAM board featuring block switchable memory, write protection switch, and a built-in expansion port for program cartridges and additional memory boards.

The Standard 16 is the lower cost basic 16K RAM board featuring limited block switching.

Both boards are fully enclosed, carry four year guarantees and come complete with an owners manual.

Mosaic Electronics, P.O. Box 708, Oregon City, OR 97045.

PLAY WITH ME

Computergame players with a 300 baud modem but with no one to play with, may find the solution to their problems in GameMaster, a time-sharing computer network.

For the initial ten dollar fee, entrants receive three free hours of computer time. After that, the fee is a mere three dollars per hour. GameMaster offers contests for one to ten players, simultaneous or saved play.

The GameMaster users guide comes in the form of a map to an old house. Each room of the house represents a game, activity or information exchange. Categories include board and card games, sports games, arcade action, military strategies, fantasy games, combat, diplomatic exercises, educationals, recipes, online conferencing, electronic mail, program exchanges and more.

GameMaster, 1723 Howard, #219, Evanston, IL 60202.

EDUCATION

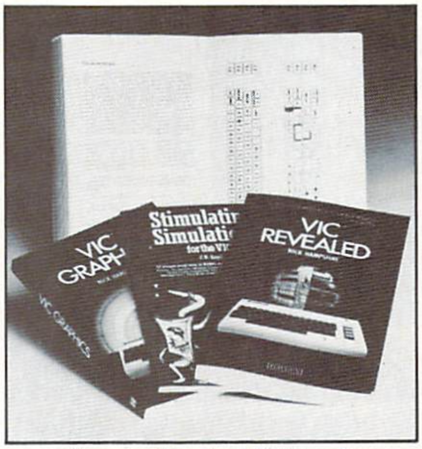
Educational software currently being used in thousands of school curricula across the country will soon become available to Commodore 64 owners. The Minnesota Educational Computing Consortium (MECC) has arranged with Commodore Business Machines to convert one hundred software programs for the C-64.

The converted programs, expected to be released on floppy diskettes, will begin to appear in the winter of '83. Subject areas include biology, music, earth science, social studies, math, reading, nutrition, language arts, English, spelling, and computer literacy. Marketing will be handled by both Commodore and MECC, through their regular distribution channels.

Sunburst Communications has introduced four new educational programs for the 64:

The Factory: Strategies in Problem Solving (Grade four to adult). The user is challenged to design an assembly line and then create products for it. The three levels include Test A Machine, Build A Factory and Make A Product. Visual discrimination, spacial perception, induction, logic, working backwards, analyzing a process, and applying creativity are among the skills encouraged. Color graphics. Diskette. $49.

Survival Math: Simulations (Grade six to adult). Practical decision-making skills are challenged in four simulations: Travel Agent Contest (budget a trip), Smart Shopper Marathon (price comparisons), Hot Dog Stand (make inventory and price decisions based on many variables) and Foreman's Assistant (plan a playroom within a given time frame and budget). Diskette. $50.



Commodore's VIC books.

Challenge Math (Grades four to six). Whole number and decimal operations are practiced in three games: Alien Intruder, Digitosaurus, and Math Mansion. Diskette. $49.

Exploring LOGO: Commodore (Terrapin) (Grade six to nine, teacher). Activity cards teach a programming concept, present a challenge, and offer hints to working through the challenge. Reference cards summarize LOGO commands and provide a glossary and troubleshooting tips. Diskette gives sample programs. Plus teacher's guide. $39.

FLOPPY PERIPHERALS

Here is a brief rundown on recently published books that will be of some interest to Commodore owners.

In a collaboration with Hayden Books, Commodore will be distributing four titles: *VIC Revealed, VIC Graphics, VIC Games,* all by Nick Hampshire, and *Stimulating Simulations for the VIC* by C.W. Engel. The four volume set sells for $24.95

Commodore has also just published the third volume of the *Commodore Software Encyclopedia.* The book covers the full Commodore line of computers with nearly 2,000 entries. The 800 page book includes a 23 page index.

From Addison-Wesley (Reading, MA 01867): *Cosmic Games for the Commodore VIC 20* (no author or editor listed; maybe they're too cosmic for words).

From ARCsoft Publishers (Woodsboro, MD 21798): *Commodore 64/VIC 20 Computer Programs for Beginners,* by Howard Adler. Three dozen all-new programs. 96 pp. $8.95.

From Dilthium Press (PO Box 606, Beaverton, OR 97075) *How to Use the Commodore 64* and *How to Use the VIC 20.* Both by Jerry and Deborah Willis, both $3.95.

From McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020) *Learning With Commodore Logo.* $16.95. By Daniel Watt.

From Melbourne House Software Inc. (347 Reedwood Drive, Nashville, TN 37217) *Commodore 64 Exposed* and *VIC 20 Exposed.* Both are programming guides, both sell for $14.95.

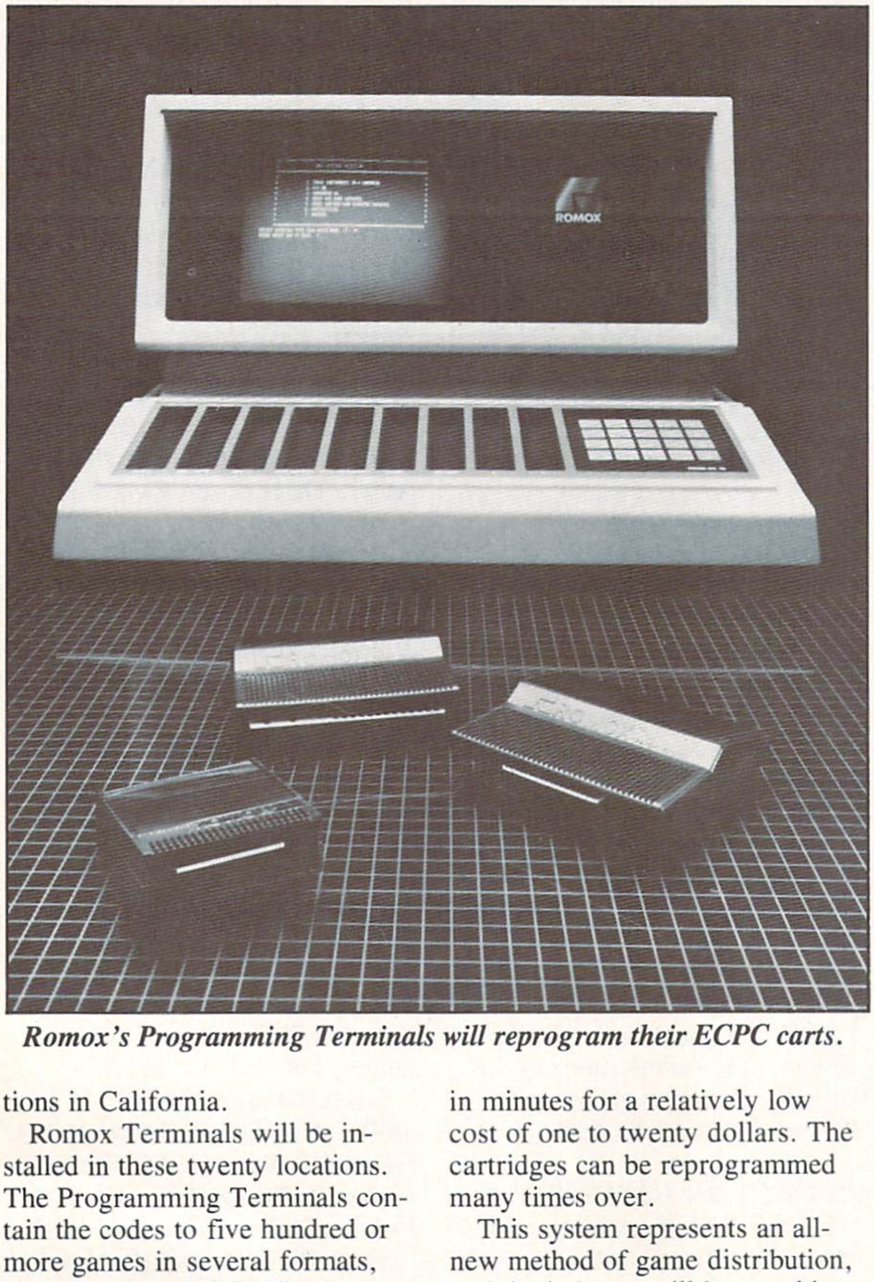
From Osborne/McGraw Hill (2600 Tenth Street, Berkeley, CA 94710) *Commodore 64: Fun and Games* by Ron Jeffries, Glen Fisher and Brian Sawyer. $11.95.

From Prentice-Hall (Englewood Cliffs, NJ 07632) *Sprite Graphics for the Commodore 64* by Sally Greenwood Larsen. $15.95.

From TAB Books. (Blue Ridge Summit, PA 17214): *Commodore 64 Graphics and Sound Programming.* $14.95.

NEW WAVE

Romox Inc. of Campbell, California has begun market testing of their new software distribution system in twenty loca-



Romox's Programming Terminals will reprogram their ECPC carts.

tions in California.

Romox Terminals will be installed in these twenty locations. The Programming Terminals contain the codes to five hundred or more games in several formats, including those of the Commodore 64 and VIC-20. At the same time, ECPC's, Romox's EPROM cartridges, will be made available to the public. One ECPC (edge connector programmable cartridge) can be purchased for fifteen to thirty dollars. If the purchaser doesn't like the game or grows tired of it, (s)he can take the cartridge to a Romox Programming Terminal and have it reprogrammed with a new game in minutes for a relatively low cost of one to twenty dollars. The cartridges can be reprogrammed many times over.

This system represents an all-new method of game distribution, and the industry will be watching the experiment closely. If the system works, retailers will have much more shelf space available. Software publishers will be provided with an instant glimpse of a new game's popularity. Smaller, newer game creators will be able to sell their games on a mass market basis without the costs and headaches of manufacturing and distribution.

Participating in the initial test marketing will be Creative Software, Terroguard, Videomania, and Black Hole; in addition to Romox, these companies will be making their games available to the system.

DIFFERENT STROKES

Broderbund Software is producing and distributing Lightning Software's *Mastertype* in cartridge format for the VIC-20.

The typing instruction program takes the user through eighteen skill-building lessons, starting with touch-typing basics and moving on to improve speed and accuracy by sending waves of attacking words his/her way. Players can also make up their own lessons and word lists.

Scheduled for October release, the price will be $39.95.

WORD PROCESSOR

With home computer prices plummeting, you may have thought that a C-64 would soon cost less than a suitable 64-compatible word processor. Commodore has forestalled that irony with *Easy Script 64*, retailing for under $50.

The program will print up to 240 characters per line and view/scroll 764 lines and 130 columns. A form letter command permits the user to add personalized salutations and body copy to form letters.

Other features include section-to-section copy transfer, global/local "hunt and find" and "search and replace," vertical as well as horizontal tabs, Goto line number, special function key editing, transfer words and phrases, superscripts and subscripts, optional sound effect prompts, and interface capability with Commodore's *Easy Spell 64*.

Designed for the Commodore 64 and SX-64 color computers,



Computer-driven blow-dryer? No, it's Vaisala's Weather Station.

Easy Script 64 is already available.

WEATHER REPORT

Everybody talks about the weather—nobody does anything about it. But now 64 and VIC-20 owners can at least predict it with *HAWS* (Home Automatic Weather Station) from Vaisala.

Combining a weather sensor, supposedly the same one used by sixty countries worldwide, with software that teaches, forecasts, and graphically displays weather, *HAWS* allows the user to monitor weather conditions inside and outside the home and to interact with the program to help predict changing conditions. Practical applications include teaching meteorology concepts and monitoring and controlling indoor living space such as greenhouses and offices.

Priced at $199.95, the package includes sensor, choice of cassette or floppy disk program, fifteen-foot cable with connector, and user manual. Contact Consumer Products, Vaisala, 2 Tower Office Park, Woburn, MA 01801 (Phone: 617-933-4500).

USER GROUP BULLETIN BOARD

VIC-20, C-64, PET, and CBM users may obtain public domain programs from the Folklife Terminal Club, Box 2222-CA, Mt. Vernon, NY 10551. More than 5000 programs in education, science, business, games, utilities, and over twenty-five other categories are available for a copying and mailing fee of $15 per diskette. You'll have to invest your first $15 in the "Catalog Disk," listing all available programs and ordering instructions.

JUST CALL ME COMPUTER ED

While the stereotype of the boring accountant persists, Computer Ed. is seemingly trying for a different image for its new financial records management system by titling it *Hot Accounts*. Designed for Commodore 64 users who have no formal accounting training, the full color program produces ten types of printed reports and income statements.

Program capabilities include recording daily income and expense transactions, full data retrieval, and searching and sorting information by a single demand factor. Printed information can be bar graphed, with account totals and percentage factors highlighted.

Other features include on-screen user directions, automatic initialization to format new record-storing diskettes, automatic backup of records, controlled spacing, memory space query, and simple menu-driven operations. The accompanying manual, providing technical documentation and bookkeeping instruction, allows the user to title up to two hundred revenue and over five hundred expense classifications.

Release date has not yet been set for *Hot Accounts,* which will be available on disk format for $64.95.

Computer Ed., 10002 Brookes Avenue West, Dan Diego, CA 92103.

Commodore will mass market *Multiplan,* a multi-page financial spreadsheet for home budgets, financial planning, small business accounting, statistics and other uses requiring financial analysis and calculation.

Developed by Microsoft, Inc., the software will be available on floppy diskettes for the C-64. Retail price of the product will be under $100.

Once you've financial-managed your way to a fortune, you'll want to report it to the IRS. In addition to *Tax Command* (described above) and *Hometax* (reviewed in this issue), we've just received word of KSOFT's new *Tax Return Helper,* due out in January.

The five programs included allow you to enter data into a screen copy of Form 1040 and Schedules A-E. In addition to performing all computations, it detects some errors.

The 16K cassette for the 64 and VIC-20 costs $23, plus $1.50 postage, from KSOFT, 845 Wellner Road, Naperville, IL 60540.

What does Commodore have that Apple, IBM & TRS 80 Don't?

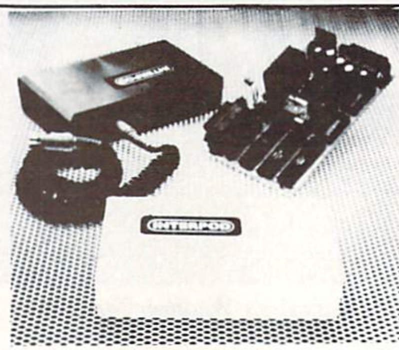
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Get down to business with the right connections! HARDBOX & SOFTBOX are compatible with the 3000, 4000 and 8000 series PET®/CBM® -- turning your computer into a professional, high end microcomputer system.



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SOFTBOX converts the Commodore to a hard disk-based CP/M* system. As well as accessing a Corvus drive, the SOFTBOX allows you to make use of an expanded library of software and power your computer to professional applications.

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THE LIMBIC CONNECTION. . .

CONNECTING THE FEATURES OF THE FUTURE FOR TODAY'S COMMODORE USERS.

Reader Service No. 6

The Computer As Communications Device

© By M. David Stone

Just about everyone who owns a computer is at least vaguely aware that there are things "out there someplace" called information utilities—computer systems that you can call by phone, and hook up with to get information of all kinds.

The key phrase, unfortunately, is "vaguely aware." Like most things dealing with computers, you can't really appreciate what an information utility is like until you've had some firsthand experience. And, like most things dealing with computers, learning enough to get started can be a major stumbling block.

I can't give you the first-hand experience, but I can give you the information you need to get started—enough, at least, to show you how to set up your Commodore 64 or VIC-20 so it can talk to these utilities.

TURNING YOUR COMPUTER INTO A TERMINAL

When you call an information utility, you are not using your computer as a computer. You're using it as a a terminal, a device for sending information to, and receiving information from, the utility's computer. To do that, you need a program that will turn your computer into a terminal.



The indispensible appliance of the '80s.

Terminal programs (also known as terminal emulator programs or communications programs) come in two basic forms: Dumb and Smart. (See box for specific programs.)

Dumb terminal programs turn off most of the functions of your computer, leaving you with a keyboard and a screen. The keyboard becomes an input device to send information to the utility's computer; the screen becomes an output device for receiving information. The rest of your system—and all its capabilities—are ignored.

Smart terminal programs take advantage of your computer's capabilities. They let you store incoming information by sending it to your printer or to disk or tape. They also let you send information from disk or tape—a feature that lets you type information into your computer beforehand, then send it at your computer's communication speed, rather than your typing speed. This helps keep phone bills and connect-time charges down to a minimum.

In addition to a terminal program, you need one other thing: A modem.

A modem (short for MOdulator-DEModulator) is the gadget that lets computers talk over phone lines. You don't need to know much about them, but there are a few terms and a few variations on modems that you should be aware of.

To begin with there are several different communications protocols that modems can use. The two most common go by the not-so-enchanting names of Bell 103 and Bell 212.

You don't need to know the technical details of these protocols—any more than you need to know the technical details of audio modulation or frequency modulation before you can use an AM or FM radio. What you do need to know is this: If you're

using one protocol, you can't talk to a computer that's using a different one—any more than you can use an AM radio to listen to an FM station.

A minor source of confusion here is that protocols occasionally parade around under different names. Bell 103-compatible modems, for example, use exactly the same protocols as Bell 113-compatible modems, which means you will sometimes see references to a modem being "103-compatible" or "113-compatible" or even "100-series compatible." These all mean the same thing. Similarly, Bell 212 modems are "really" 212A modems. Here again, you will see references both ways, and both mean the same thing.

Tied to the question of protocols is the question of speed. This is generally measured in terms of something called baud rate. 103-compatible modems are usually limited to a maximum speed of 300 baud. 212-compatible modems work at 1200 baud. These translate into transmission speeds of 30 characters per second and 120 characters per second respectively.

1200 baud modems, obviously, will let you send or receive information faster than 300 baud modems, but they have some drawbacks. First, they're expensive. Most 1200 baud modems cost more than a Commodore 64. Many utilities, moreover, charge extra at 1200 baud. And many small bulletin board services can't communicate at 1200 baud to begin with.

What this all adds up to is, get a 103-compatible, 300 baud modem. These start at about $100 list price, and are widely available at a discount. If you're willing to spend several hundred dollars, you can get a modem that is both 103-compatible, and 212-compatible. But stay away from modems that are 212-compatible only, and stay away from modems that use other, less common protocols (Bell 202 and Racal Vadic 3400 for example).

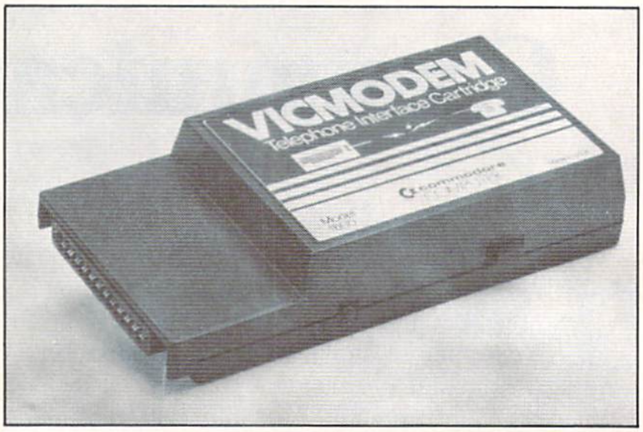
CONNECTING THE MODEM TO YOUR COMPUTER

Some modems, including Commodore's VICMODEM, plug directly into the Vic or 64 user's port on the left rear of the machine. This approach limits your choice to very few modems, though.

The vast majority of modems can connect to virtually any computer through an industry-wide standard known as an RS-232 port. Neither the Vic 20 nor the Commodore 64 comes with this standard port, but an RS-232 Terminal Interface can be added to either. The current list price for this option is $49.50.

CONNECTING YOUR SYSTEM TO THE WORLD

Modems also vary in the way they connect to the phone lines. Direct connect modems plug into the phone system the same way a phone does—with a modular plug. Acoustically coupled modems talk over a phone handset. The modem has two rubber cups, with a microphone in one and a speaker in the other. The handset is placed in the cups, and the modem communicates by squealing into the phone and listening to the other modem on the other end of the phone line.



VICMODEM plugs directly into the user's port.

Acoustically coupled modems are preferred when portability is important. You can use them in airports, hotel rooms, and so forth. They tend to be unreliable in noisy locations, though, since they will pick up random noise and generate garbage characters on the screen. Unless you move around a lot, or you don't have a modular plug phone, get a direct connect modem.

There you have it—the basics at least. Be aware that this is only a brief introduction to a complex and changing field—a bare-bones overview. Even so, it should be enough to get you started. From here on, it's like swimming. If you want to find out what the water's like, you have to jump in and get wet. Be prepared to feel overwhelmed at first, and be prepared for a few false starts, but be assured that the pieces will very quickly fall in place. It won't be long before you feel just as comfortable talking by computer as talking by phone.

TERMINAL PROGRAMS

First, two dumb terminal programs. Before you rush out and buy one, notice that some modems come equipped with their own dumb terminal programs.

CTE/VTE, $9.95 on tape/$17.95 on Disk
Micro Systems Development, Inc.
Phone: (800) 527-5285

MW-300, $39.95
Micro World Electronix Inc.
Phone: (303) 987-9531
Comments: This is for the Vic 20 only.

Here are three smart terminal programs:
EasyComm 64. (This program is still being data tested as of this writing; it will probably sell for around $50.)
Commodore Business Machines, Inc.
Comments: This is for the 64 only. Features also include auto-dial and auto-answer. (If your modem has these capabilities.)

VTE 40, $49.95
Micro Systems Development, Inc.
Phone: (800) 527-5285
Comments: This is for the Vic 20 only. In addition to turning the Vic into a smart terminal, it also changes the display to 40 characters per line.

OMNICOMM Vic Version $34.95, 64 Version $39.95
Software to Go,
Phone: (615) 482-9592
Comments: The Vic version requires 8K expansion memory. 16K is recommended.

MODEMS

Two modems that plug into the Vic or 64 user's port are: Commodore VICMODEM, $109.95.
Comments: The VICMODEM comes with a dumb terminal program.

Bizcomp 1080 Versa Modem(TM), $139.
Bizcomp Corporation.
Phone: (408) 745-1616.
Comments: The VersaModem comes with a terminal program.

Two inexpensive RS-232 modems are:
Anchor Signalman, $99.00
Distributor: Leading Edge.
Phone: (800) 343-6833

Lexicon Corp, Lex-11, $175.00
Lexicon Corp.
Phone: (305) 792-4400
Comments: This is an acoustically coupled modem.

UTILITIES

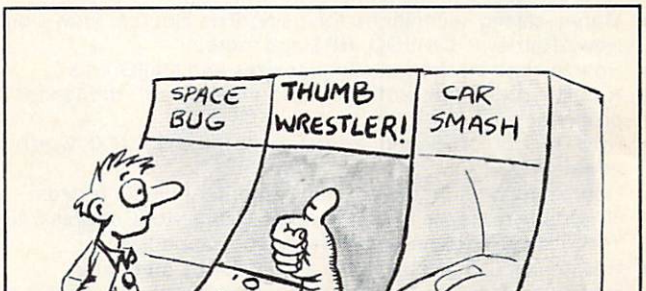
Once you have your terminal up and running, the next question is who to call. Here is a short list, along with phone numbers to call for further information.

First, here are three general interest utilities aimed at both the consumer and the business user. Services on each range from games, to electronic mail, to electronic newspapers, to general business information. 1) CompuServe Information Service, (800) 848-8199. 2) Delphi(tm) (General Videotex Corp.) (617) 491-3393. 3) The Source (sm)—Source Telecomputing Corporation, (800) 336-3366, (703) 734-7500 (In Virginia).

Another place to start is with the hundreds of free bulletin boards run by clubs, user's groups, computer stores, and individuals. Most bulletin boards maintain lists of other active bulletin boards. One of the more current lists is available on the People's Message System, located in Santee, California. The phone number is (619) 561-7277. When you call this number, be prepared to communicate. The voice at the other end will belong to a 300 baud modem. □

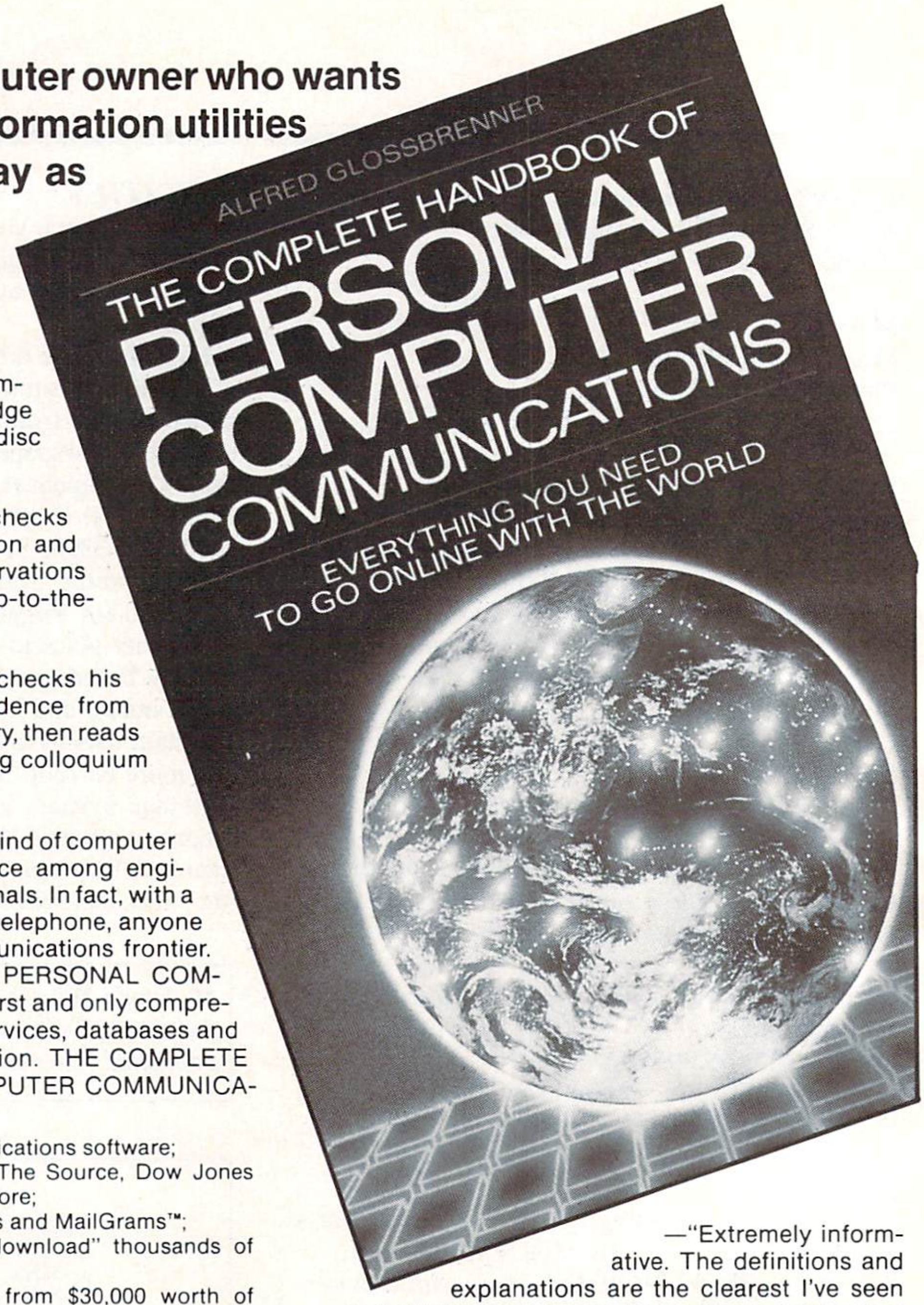
M. David Stone's book Getting Online: A Guide to Accessing Computer Information Services, *will be published late this year by Prentice-Hall.*

Reader Service No. 7



"Essential to any computer owner who wants to plug into the vast information utilities that lie only as far away as the telephone."

—Forbes



*A consulting engineer orders a computer search of recent articles on bridge construction, then stores the data on disc for future use;

*An executive on a business trip checks weather conditions at her destination and last night's sports scores, makes reservations for her return flight, and obtains up-to-the-minute quotes on her stock portfolio;

*A pilot whose hobby is avionics checks his "electronic mailbox" for correspondence from other avionics buffs around the country, then reads the latest contributions to an ongoing colloquium on proposed FAA regulations.

These are just a few examples of the kind of computer communications already taking place among engineers, scientists, and other professionals. In fact, with a personal computer, a modem, and a telephone, anyone can have access to this new communications frontier. THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS is the first and only comprehensive guide to the vast array of services, databases and "information utilities" now in operation. THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS covers all this and more:

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- How to send electronic letters, telexes and MailGrams™;
- How to order free software and "download" thousands of programs;
- How to get privileged information from $30,000 worth of newsletters;
- How to get on hundreds of *free* computer bulletin boards;
- How to gain access to vast libraries (Library of Congress, New York Times, magazines and whole encyclopedias);
- How to invest, bank, pay bills and barter by computer;
- How to get free tips on troubleshooting, debugging, and short-cut commands from computer professionals.

THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS provides complete data on manufacturers and services, with current prices, subscription rates, addresses and telephone numbers. It offers hundreds of "online tips" designed to save the operator's time and money. THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS was written for anyone who wants to make the most of a personal computer. In fact, we think it's the best book on computer communications ever written. Send for your copy today.

For information on quantity discounts and course adoptions, contact Peter Garlid, St. Martin's Press, 800-221-7945, or in New York State, (212) 674-5151.

—"Extremely informative. The definitions and explanations are the clearest I've seen and will be welcomed by the novice as well as the more seasoned personal computer user. Thanks to Glossbrenner, 'Computerese' has now been demystified."
—Michael Israel, Vice President, Marketing, New York Times Information Service, Inc. (NYTIS).

Main Selection, Small Computer Book Club
Alternate Science Selection, Book-of-the-Month Club

Please send me _____ copies of THE COMPLETE HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS at $16.45 per copy *delivered.*

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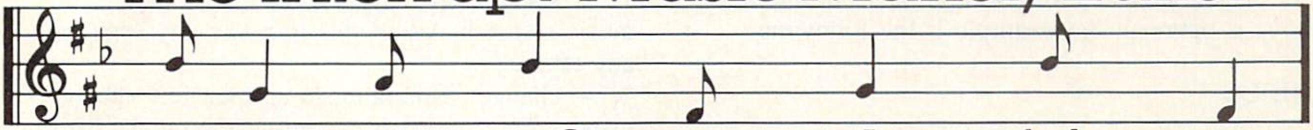
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Reader Service No. 8

By Pete Lobl

The Interrupt Music Maker/Editor For The Commodore 64



Out of my own frustrations with the available material, I sat down one fine June day and wrote a simple little machine language program which played music. Gradually I expanded the program so it could play music while the computer did something else (on interrupt). What follows now is the polished and enhanced version of a music editor which will allow you to write, play back, and save all your compositions to either disk or tape. There is no need to bother looking up any of those nasty pokes; just sit back and compose, the computer will do the rest!

The Interrupt Music Maker/Editor, (IMM/E for short), is written almost entirely in BASIC. There are a couple of machine language ← subroutines included in the DATA statements, but for the most part it is all BASIC. The ML routines control the music playing, however, and this is the heart of the program. Later on, you can use the music and create in your own programs, and the only program you need present is the interrupt driver.

Now, I am going to simply give you a run-down of how to use the IMM/E. Next issue, I'll include a couple of music listings, plus a whole ton of explanations, but till then, hear me out, and simply experiment.

After typing in the IMM/E, you should SAVE it right away before RUNning it. This is good practice since if you have made a typing error, all your work will still be available in case the Program should bomb.

At any rate, the first question you are asked by the IMM/E is if you want to reset the clocks. If you want to reset the 64's built in timers, say 'Y'. If not say 'N', and hit 'RETURN'.

After a brief delay, you are now confronted with the main IMM/E display. The top line shows how many free blocks (notes) are left for that voice, the current clock time, and what voice you are currently using. The second line of info shows you the data as it is stored in the computer, all numbers. Below that is an English translation telling you the duration and note stored in that specific block. A block is simply a group of 3 bytes, which contain a duration of up to 255 (first byte), and then the note itself (2 bytes). The computer has 2730 note storage for each voice, so you'll find it hard to run out of room. Below the note decoder is the block counter telling you what you're on. Finally, there is the input line, and this is reserved especially for you. Here all your actions to the computer are entered. Below the input is a reminder list of the commands, and toward the bottom of the screen is the last line of display. This tells the current octave for the voice you are on, the tempo at which each entered note is altered, and the current speed of the music. Whew!!!!

Enough for the display, on to the commands.

COMMANDS

To enter music into the IMM/E, you have to follow a certain syntax. It goes as follows:

(Octave)Letter of note[space] duration. The Octave Part is optional, and if none is given, the current one shown at the bottom of the screen will be used. Letter of note is self-explanatory. After the needed space, the duration must be given. It can be any number from 0 to 255, or it can be a special letter. Here is a table of them:

s = sixteenth note (duration = 8)
e = eighth note (16)
q = quarter note (32)
h = half note (64)
w = whole note (128)

In general, these values will be quite sufficient for normal use. However, in certain cases, the direct

number entry may be better. You can also add another letter onto the end of the above special cases if you want a longer or shorter note. Add an 'S' to the end of the letter for a shortened note (by 1) or add an 'H' if you want a held out one. This, too, is optional. An example is the following:

4E QS

This would enter a short quarter note, played to an E on the fourth octave. For flat or sharp notes, add either a 'B' for flats, or a '#' for sharps.

6D# 34

This would store a note of 34 cycles duration (an extra-long quarter) as a 6th octave d sharp. Get it?

An automatic feature of the IMM/E is to put a one beat rest between every note. When entering durations in numbers instead of letters, this is not automatically entered. To do so, you must change the AUTO subcommand under the CHANGE command to 1. More on how to do that later.

To use any of the commands in the IMM/E, you must first precede it with an asterisk '*'. After the asterisk, use the first letter of the command as shown on the screen in reversed letters. Here is a list of available commands and their subcommands:

*x = exit. This lets you leave the program and save your ML for later use in your own programs.
*n = goes to the next block of music to display.
*b = goes back one block of music.
*g = lets you input what block you want to see.
*t = lets you transfer music from one section of music to another. This is useful for repeats, codas, etc. It allows to send music across voices, also.
*f = find. This allows to search a certain number of blocks for your specific pattern. Numbers input are shown when a match is found. Remember, the first byte is duration, second is high music byte, and third is the low music byte.
*p = play. This lets you hear your music entered. Give waveform, which voices you want to hear, and each one's location before music begins to play. To stop playing music, enter another *p to clear it.
*s = this lets you save music to tape or disk.
*l = this allows you to load in previously saved music.
*v = this lets you set the volume and other Sid-chip parameters.
*? = this lets you dump sections of your music to the Vic-Printer for closer examination.
*e = edit. This allows you to edit single bytes of music by giving the notes location above it. Normally, about 3 times the block number.
*z = speed. This lets you change the whole music's speed. Adjust this to make any song go any tempo!
*c = change. This is made up of a few subcommands. They range from setting the clocks (ti) to changing the AUTO feature. Here is where you set the ATTACK-DECAY/SUSTAIN/RELEASE settings, too (DSR).
*h = help. This lists all the commands and gives some quick info.

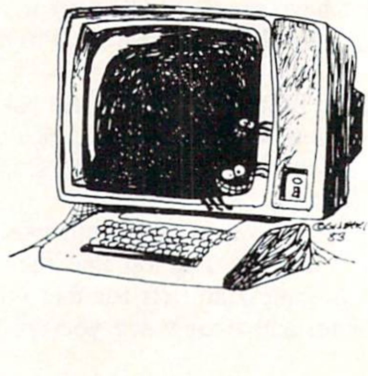
Whew! Sure are a lot of commands!! Anyhow, before I sign off I have to make 2 important points. One, before entering any music, the first block of music should contain an attack-decay/sustain-release setting. Do this via the CHANGE command and the DSR subcommand. Also the A-D/S-R can be changed from within the song, as many times as you wish. This makes the IMM/E *very* powerful.

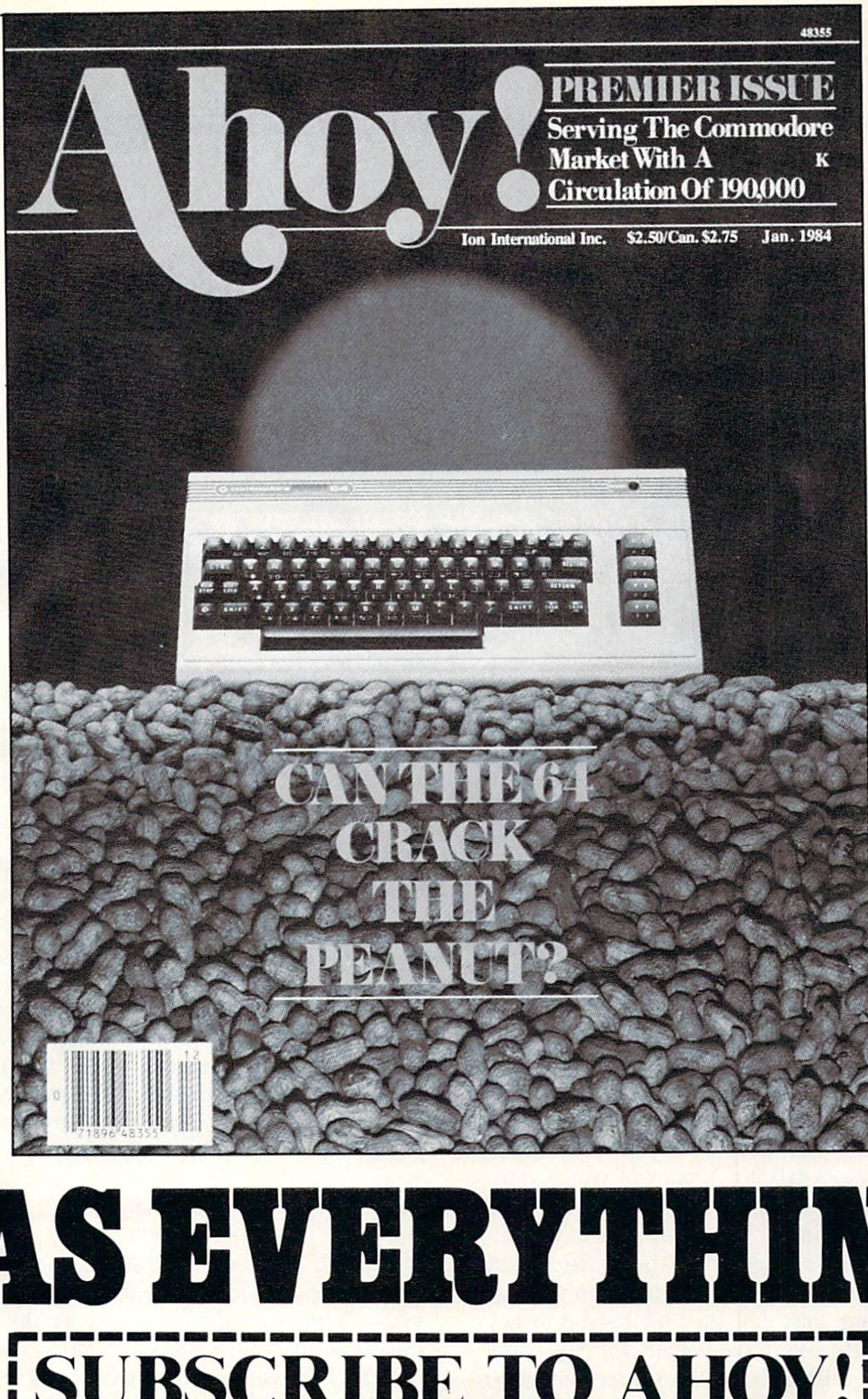
Point 2, don't get discouraged. I know it's a lot of typing, but I think you'll be happy that you entered it in. If you are confused with program execution I will try to clarify things next month. OK?

Next month, Basically Machine Language will try to sort out the IMM/E giving some sample songs to input and some helpful hints on its use. I will also try to explain some of the advanced basic techniques as we try to jump into that new realm, *Machine Language!* Until next time, Happy Hacking.

*Note: Some lines contain more than 80 characters. In order to enter these long lines into your computer, you use the Keywords abbreviations, i.e. '?' for 'PRINT', and you also leave out any unneeded spaces. Consult the manual that came with your computer for a table of these abbreviations.

SEE PROGRAM ON PAGE 79





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Interview With Bill Badser from Protecto Enterprises

AHOY!: How did Protecto get its start?

BILL BADSER: Originally we started with a computer called the Interact, and we ran the national marketing for them for about two years. About the time Interact went out of business, ATF came out with their Imagination Machine, which was actually a very good little computer. When Commodore came into the market, ATF wanted to get out of that particular market, so we sold out of ATF and looked around for a new computer. You know, the problem with a lot of the computer companies out there is that they don't offer a lot of full support; they sell machines and that's it; they don't support the customer. In other words, you call up and end up talking to an order-taking girl who hasn't even put her hands on the computer she's selling you. We decided what we wanted to do is offer the consumer somebody they can talk to. Matter of fact, Commodore used to refer people to us from their own customer support lines. All of our sales people know the equipment, they know the product, and they know what's being sold. If they don't know they know where they can send the person to get the right answers. We have gained a pretty good reputation along those lines. We started with Commodore about two years ago, when the VIC-20 first came out, working out of the basement of John Schelley's [president and co-founder of Protecto Enterprises] house. That was about the time that I came in with the company, and from that point we've grown. We bought a warehouse last July, we've quadrupled our office space and phone lines, and we have doubled our warehouse space as well.

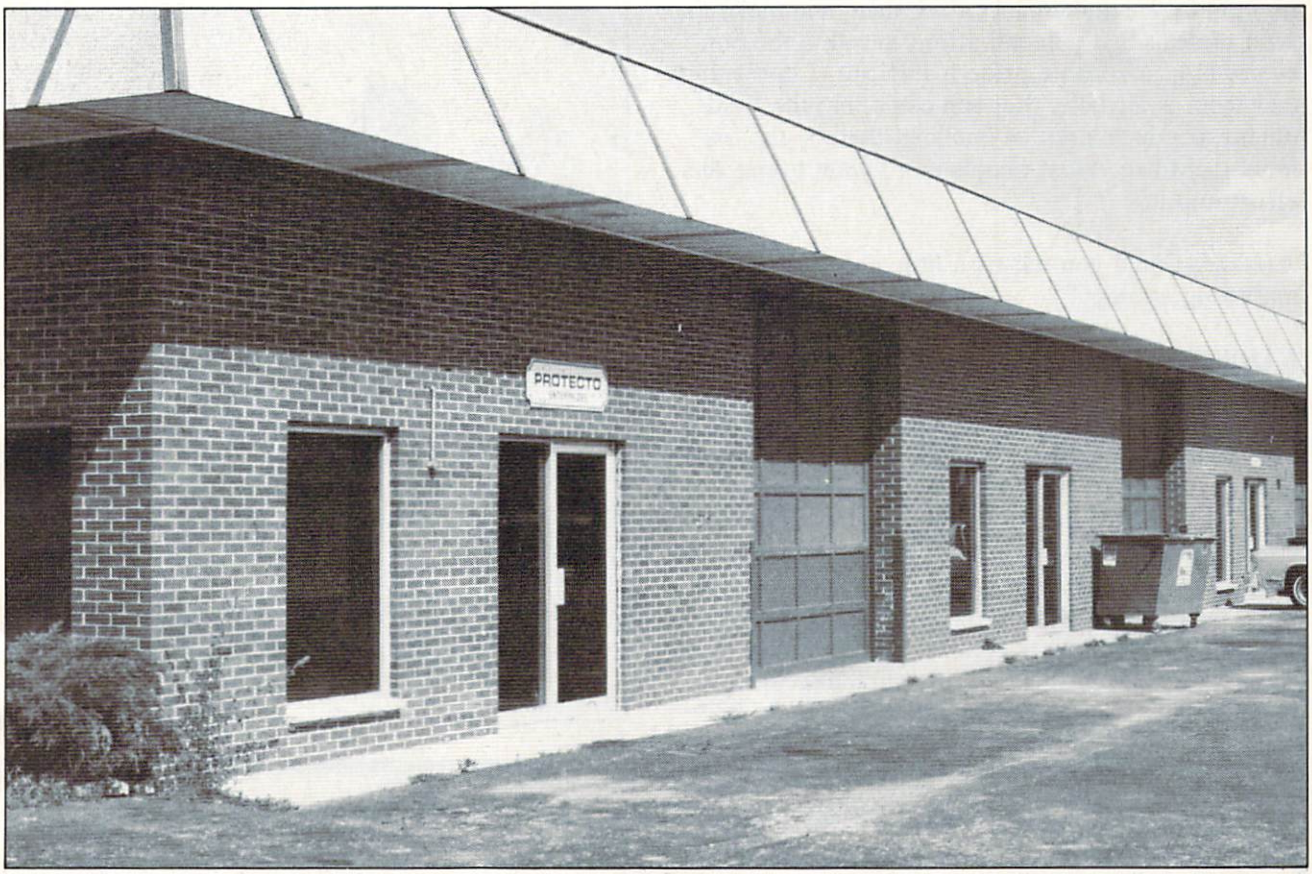
AHOY!: What do you owe your rapid growth to?

BADSER: Basically it's customer service. We have so many repeat customers it's ridiculous. That's because when a person cables us, we're not going to give him a song and dance. We're going to sell him the right thing, and we're going to try and sell him the thing that he wants. If he calls up and says 'I want this,' even though I have it in stock, if it doesn't meet his applications, my people are going to tell him that's not really what he wants. Don't get me wrong, we'll sell it to him if he wants, but we will steer him in the right direction. The second thing that we attribute our growth to is our fast service. A person in Anchorage, Alaska can call me up this morning and order a computer, order a couple of pieces of software, and have it the next day. I think we're the only computer company in the United States where you can do impulse buying by phone.

AHOY!: How do you arrange that?

BADSER: Well, we have a special arrangement with the post office to use their express mail services. It costs a little more, but we don't charge more than it really costs us. And we can get the pieces to the person with next day service. We also do Blue Label work with UPS, and we do UPS itself. Furthermore, we take all kinds of credit cards and COD, which very few companies will do these days. So we're trying to reach out and grab as many customers as we can. It's through Telemarketing that we do the bulk of our business. People like to talk to other people. The last thing that has really been a good thing for us has been our fifteen day free trial policy. No matter what you buy from us, if you don't like the color of the box

By Robert J. Sodaro



Protecto Enterprises' offices in Barrington, Illinois.

that it's in, you can always send it back to us, and you'll get a full refund within forty-eight hours. I don't think that there's another company in the United States that does that. That works with our services as well, as far as repairs go. For instance, Commodore 64, they've been known to have some problems. If you take it back to a local dealer somewhere, it may be a month before you get a new computer. We don't bother with that. A person sends a computer to us, we just replace it. Out of warranty, we have standard fees. We're not going to sit there and hold it for him for four months. If a person bought a computer from us, and five months down the line it's out of warranty, it costs him the standard fifty-five dollar fee, and he gets a brand new computer. We do the same thing for printers and everything else we sell, even our software.

AHOY!: Any particular reason why you went with Commodore?

BADSER: Well, they have the best product, as far as I'm concerned, so if you're going to do something and be the best, you've got to concentrate your efforts. All we sell are VIC-20s and Commodore 64s. I don't even touch the PETs or any of the other computers. All the software I buy is for the Commodore 64 and VIC-20. I don't have to worry what Atari's doing. I don't have to worry about what software companies are out there for Atari. I just concentrate my efforts on Commodore. We sell other software and hardware made by other people, third party stuff for Commofore. As a matter of fact, I think that we probably have the largest selection of anybody in the United States. Anytime there are new products out there, we find them. We have people who do nothing but make the rounds; call, find out what new companies are out there.

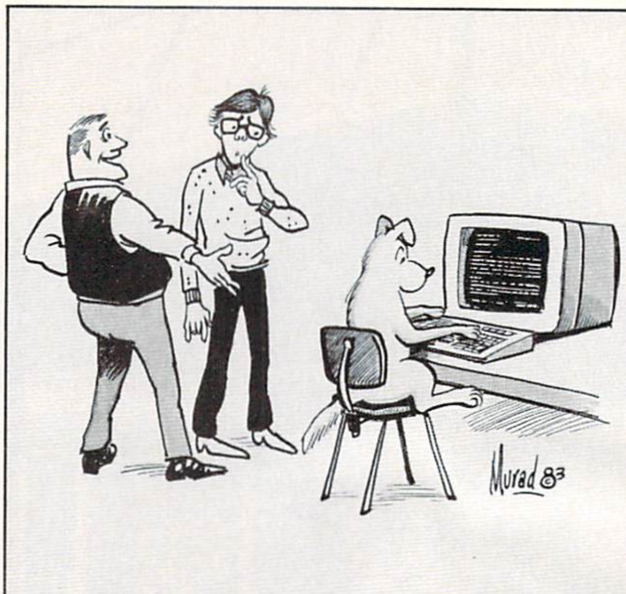
AHOY!: Why do you think that no one else is doing the mail order on the level that you're doing it?

BADSER: When we started with Commodore, there were about three third party software companies making software for the VIC-20, and we looked up all of them. Now, there are about fifty or sixty, and

to go out there and contact all of them and make the kind of deals that you can afford to sell to the consumer at a reasonable price is difficult. I don't think that there is anybody that can come into the field unless they have a lot of backing, there's just too much out there. Most people don't want to put the effort into it.

AHOY!: Could you tell us a little about your marketing strategy?

BADSER: Well, when your dealer has to buy at his distributor, say a Commodore at $219, and K-Mart down the street is selling it for $199, it's hard to put a mark-up on anything. Commodore started with a network of some eight hundred dealers, and they're now down to below four hundred. So where else do you go? If you walk into K-Mart, they don't even know what a computer is. They know they carry them, but that's all. You can't walk into a dealer, because there is none. So the best way to do it is pick up the phone and give old Protecto Enterprises a call.



"Surprisingly, his bark really is worse than his byte!"

TELSTAR 64

Sophisticated Terminal Communications Cartridge for the 64.

PFO 10D 00D CP D1 D2 BELL 12:30:00 10:14:36
(TELSTAR's Status Line)

Don't settle for less than the best!

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If you own a VIC 20 or a CBM 64 and have been concerned about the high cost of a disk to store your programs on ... worry yourself no longer. Now there's the RABBIT. The RABBIT comes in a cartridge, and at a much, much lower price than the average disk. And speed ... this is one fast RABBIT. With the RABBIT you can load and store on your CBM datasette an 8K program in almost 30 seconds, compared to the current 3 minutes of a VIC 20 or CBM 64, almost as fast as the 1541 disk drive.

The RABBIT is easy to install, allows one to Append Basic Programs, works with or without Expansion Memory, and provides two data file modes. The RABBIT is not only fast but reliable.

(The Rabbit for the VIC 20 contains an expansion connector so you can simultaneously use your memory board, etc.)



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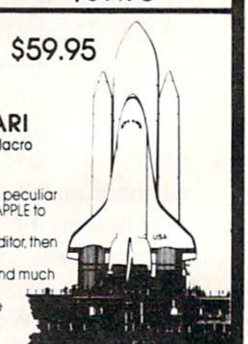
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- VOICE SYNTHESIZER $59.00

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Executive Word Processor	$99.00	$52.00
Complete Data Base	$89.00	$46.00
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Total 5.2 Word Processor—Plus		
Tape	$69.00	$37.00
Disk	$79.95	$42.00
Total Text 2.6 Word Processor—		
Tape	$44.95	$26.00
Disk	$49.95	$26.00
Total Label 2.6	$24.95	$12.00
Disk	$29.95	$15.00
Quick Brown Fox Word Processor	$69.00	$40.00
Programmers Reference Guide	$20.05	$12.50
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Basic Tutor	$29.95	$15.00
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You get the Commodore VIC-20 Computer for only $77.00 when you buy at sale prices: The Commodore Data Cassette for only $69.00 and the Gortek Introduction to Basic program for only $19.95. TOTAL LIST PRICE $302.95. SPECIAL PACKAGE SALE PRICE $165.25.

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Increases programming power 2 1/2 times. Expands total memory to 33K (33,000 bytes). Memory block switches are on outside of cover! Includes FREE $16.95 game.

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Reader Service No. 12

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NEW — only $89.00 — NEW

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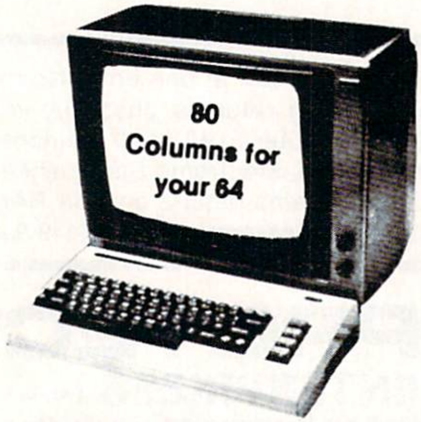
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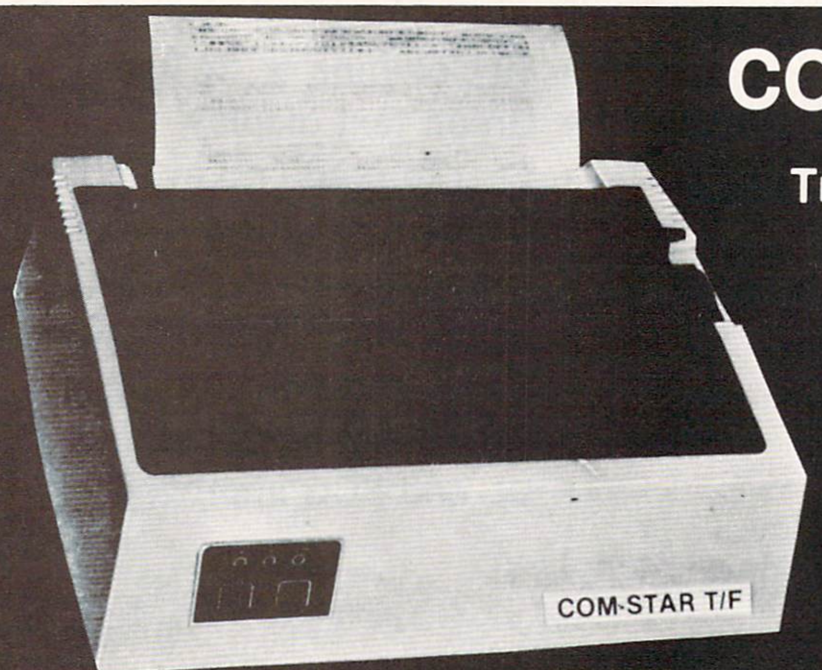
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More Features Than RX-80

For $299 you get all of the features of the Comstar T/F plus 10" carriage 120 cps, 9 x 9 dot matrix with double strike capability for 18 x 18 dot matrix. High resolution bit image (120 x 144 dot matrix), underlining, backspacing, left and right margin settings, true lower descenders, with super and subscripts, and prints standard, Italic, Block Graphics, special characters, plus 2K of user definable characters. For the ultimate in price performance the Comstar T/F Super 10" leads the pack!

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15 DAY FREE TRIAL

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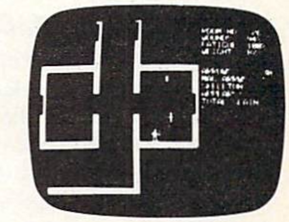
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COMMODORE - 64 / VIC-20

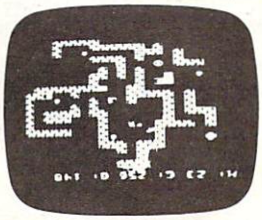
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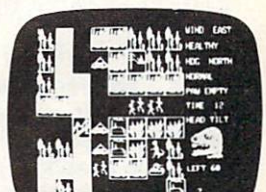
JUMPMAN
If you like Donkey Kong, you'll love Jumpman. Over 30 different screens with 8 speeds and 5 skill levels make this the fastest action game in the country. You must leap girders, climb ropes, and scale ladders to reach and diffuse bombs while avoiding robots, birds, bullets, explosives, crumbling walls, vanishing escape routes, and many other obstacles. (Truly a fantastic game!)
List $39.95 **Sale $27.95** (DISK ONLY)



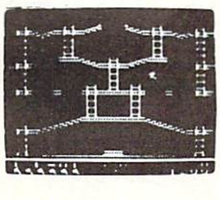
TEMPLE OF APSHAI (computer game of the year)
This is the standard by which other adventure games are judged. Full color graphics portray the temple and all its contents - magic, monsters, doomed cities and damsels in distress. Do battle in real time with over 20 monsters, expansion modules will keep your adventure alive in the future.
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Search for the wondrous sword in the depths of an ever changing dungeon. Make yourself invisible, teleport to a new location, drink a healing potion or use enchanted treasures, but watch out for traps and hideous creatures who will try to stop you. (Fantastic dungeon adventure)
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Choose one of six monsters or create your own, and use your monster to destroy one of four unsuspecting cities. The cities aren't totally defenseless, they call on police, national guard, and even a mad scientist, complete with helicopter, to save humanity from the relentless threat.
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Reader Service No. 20

By Pete Lobl

The 64 Graphics System

When the Commodore 64 was introduced, it shook the industry, but it did not shake out much software. By the time that you read this, there will be plenty of quality programs available for the 64. But as I write, there isn't much out there in the way of 64 software, so my attitude is: why wait if I can do it myself?

You can too, only don't be discouraged if everything doesn't make sense at first; in time it will all drop into place. This article and the accompanying program focus on what will probably be two of the most exploited hidden powers of the C-64: Multi-Color Bit Mapping, and Split Screens using the interrupts and the raster scan and enable registers.

MULTI-COLOR PLOTTING

Multi-color bit map mode allows you to display four different colors in an 8 dot area of the screen. In Normal or Standard Bit Map mode the horizontal resolution is 320 dots by 200 dots. In Multi-Color Bit Mapping this horizontal resolution is decreased to 160 dots per line (or 160 by 200), but because of the greater flexibility in color combinations the loss in resolution is not a severe problem or handicap. Bit mapping uses an 8K section of memory to store each dot of the screen display (320 by 200 equals 64,000 dots). Multi-color also needs an 8K section of memory. You select colors in this mode from four different locations. The following chart explains:

COLOR#	BIT PAIR	Where Color Comes From (Dex.,Hex)
0	00	Background Color (53281, $D021)
1	01	Lo 4 bits of screen ram (1024-2048,$0400-0700)
2	10	upper 4 bits screen ram (1024-2948,$0400-$0700)
3	11	Color Memory (55296-56296, $D800-$DA00)

In Hi-res bit mapping, in order to plot a point, you must first find the correct byte in your 8K map and turn the right bit ON by storing a one there.

In multi-color mode things get more complex. To receive the different colors, the dots are now replaced by 12 bit wide dots. With two bits across the dot can have 1 of 4 possible combinations, hence the four different colors. Because the dots are now twice as wide, the decrease in resolution should be more understandable.

This excellent color output explains why multi-color mode has been the choice of machine language programmers when using hi-res graphics. The reason I say machine language is because plotting or drawing in hi-res is much too slow if done completely from powerful program for games or plotting. As a matter of fact that's exactly what *Multi-Draw* is, a hybrid Machine Code/BASIC

program.

Multi-Draw is a little (not that little!) program that I wrote when there wasn't a commercially available drawing program. (As of this writing there are some very well done programs on the market.) In any event, my program allows you to draw in 16 colors on a color page (located at 8192 dec. $2000 hex). It uses keys or joystick to move the crosshair, or brush. There are several machine code routines poked into memory from BASIC using READ and DATA statements. They are called with a SYS command while the program is running.

Following is a list of the routines I have used, and also a list of commands for the program. You can receive the disassembly of the routines from me by sending a self-addressed stamped letter, care of *AHOY!*

ML Routines and their Locations in Memory

CALL PLOT	864-
PLOT 3 (plot in color 3)	2048
PLOT 2 (plot in color 2)	2304
PLOT 1 (plot in color 1)	2056
PLOT 0 (erase)	2816
CLR SCREEN	3072
REVERSE SCREEN	3200
FILL A CERTAIN COLOR#	3328
READ JOYSTICK	3584
SET UP INTERRUPT	3712
RASTER SCAN INTERRUPT (split-screen)	3840

Sprite data is mixed in with these routines above their ending locations. There is also a self-modifying Save Routine in machine code at 5376. The cassette buffer was moved to 496 ($1000) because my routines exist in the cassette buffer, and loads or saves to tape would wipe them out. This is simply done by changing pointers at 178-179 decimal. The buffer can be moved anywhere in RAM, and allows us to make auto run tape loads.

LIST OF MULTI-DRAW COMMANDS

<->	Toggles between JOYSTICK/KEY
</>	Toggles FAST/SLOW crosshair
<P>	PICKS UP PEN (move mode) or DOWN (draw mode)
<∧,*>	INC/DEC text background color
<R>	REVERSE SCREEN
<Q>	CHANGE cursor increment between points (enter 1-9 for input)
<shift>	DECREMENT CURSOR COLOR
<F1>	COLOR 1
<F3>	COLOR 2
<F5>	COLOR 3
<:,D>	INC/DEC CURRENT DRAWING COLOR
<F7/F8>	INC/DEC BACKGROUND
<HOME>	CLEARS SCREEN
<+>	Toggles CROSSHAIR ON/OFF
<F>	Fill a specified color# (1,2,3) with a color value (0-15)
<E>	ERASE MODE (color 0) (use F1,F3,F5 to go back to normal)

PROGRAM LISTING

IMPORTANT! Before running or entering the program you must enter a line directly into your computer from the immediate mode:

POKE 44,64:POKE 64*256,0:NEW<return>

Do this before loading or running this program. All it does is move BASIC up in memory to allow room for the machine code and hi-res screen. The program won't work without it, so don't forget.

PROGRAM NOTES

SAVE & LOAD: The save and load routine which I use is a bit unorthodox. I save three files onto tape/disk for each screen: one for RAM, one for bit map, one for color RAM. After entering the file name in the save load subroutines, the program searches for 3 programs on that device, even though you entered only one file name. What happened was that I added a 1, then 2, then 3 as the rightmost character during the save. This makes the save somewhat faster, taking only about 20 seconds to load a screen from disk. (Tape, of course, will be longer.) Don't add the numbers when asked for a file name, the program does it for you. The only penalty that occurs because of this is that the filename can only be 15 characters instead of the normal 16.

RASTER SCAN: Multi-draw has a window at the bottom of the screen in which normal characters can be displayed. This effect is possible because of the raster-scan interrupt, a complex but powerful ability of the 64. The location which controls where the window will start at is at 3846. Break out of the program by pressing the stop key, and try poking

Continued on page 90

By Steve Springer

CAN THE 64 CRACK THE PEANUT?

The scenario was not a new one—it had been acted out countless times before on Wall Street, with only the principal player changing. This time, the uncoveted role fell to Apple Computers Inc.

Having reached a record high of 63¾ in June, Apple's stock plummeted to 30 during the final days of August 1983. The overnight collapse stunned shareholders and followers of a company whose stock, riding the success of the Apple IIe personal computer, had ranked among the brawniest bulls on the exchange.

Apple's setback followed the market's established riches-to-rags formula, whereby a sudden, dizzying drop is initiated by a single event, or announcement, or development inside the industry or out. Where Apple's particular catastrophe distinguished itself was in the nature of that cause. The company had not announced a round of layoffs or production cutbacks. Nor had a computer-making rival put out a product that looked certain to take a large bite out of Apple's market share.

The cause of Apple's decline was a rumor: a rumor that a product of that nature would soon be released by a competitor. No specifications or release date were available—the competitor, in fact, would not even confirm the product's existence. Yet when word spread that the new computer would see the light of day earlier than the previous rumors had indicated, Apple's stock dropped through the floor.

Such is the power of the name I.B.M., and the importance industry analysts attach to its newest brainchild: the Peanut.

Apple was but one of many computer makers hurt by what the papers christened "Peanut Panic," or "The Great Peanut Roast." Tandy Corporation (the TRS-80) and Commodore International numbered among the manufacturers that exhibited abrupt market minuses directly attributed to speculation on IBM's mystery machine. The shock waves Peanut sent through the industry extended so far that, ironically, even IBM's stock dipped for awhile.

But the Apple IIe was, and is, seen as the system with the most to lose from the advent of the Peanut. Theories on exactly what the Peanut will have to offer range wildly. But if a consensus can be drawn from a hopelessly diverse body of opinion, it is that the Peanut will be able to do roughly what the IIe can do . . . for a lot less money.

While the IIe retails at press time at $1995, Peanut is expected to cost $1,000 with disk drive (add cost of display). Combine the hundreds of dollars of savings with the IBM name, IBM's marketing muscle, the fabulous reputation of the IBM service network, and the availability of thousands of IBM P.C. programs that will doubtless serve the Peanut as well—and for the average person's bread, it will be Peanut, and not Apple, butter.

Systems at the lower end of the home computer price scale figure to be far less vulnerable. Rare will be the consumer who wavers between a Peanut for $1000 and, and say, an Atari 800 for $350. Most consumers go out to make their first hardware purchase with a much narrower price range in mind. Those who cannot afford the Peanut will not buy it. Those whose purposes would be better served

by a less expensive system will in some cases be swayed by the IBM name—but the great majority of canny consumers will not pay $1200 for a name, even as solid a name as that.

No, the main upheaval at the lower end of the home computer market has already occurred. For Atari, Tandy, Texas Instruments, and dozens of other manufacturers, the enemy has been met—and surrendered to.

Last summer's whirlwind round of price slashing, dubbed the Great Computer War, left most small computer makers in the red, while Commodore rang up $26.7 million in earnings during the quarter ending June 30. While competitors wound up pricing their hardware at below manufacturing cost, Commodore remained highly profitable—and established a hold on the market that is not expected to be soon relinquished.

The agreement among analysts that Commodore will remain strong for some time to come is good news for the present Commodore owner, who wants his or her system to be compatible with as many other people's as possible. (S)he also wants the widest variety of software and peripherals to be produced in years to come. Both, of course, depend directly on sales.

But Peanut is too important a development in the home computer market to be discounted as a threat to Commodore. If the scenario progresses as many experts feel it will, and Peanut all but eliminates its competition at the top end of the scale while Commodore does the same at the bottom, will IBM content itself with peaceful coexistence? Their aggressive marketing history would argue against it. A showdown on some level between the Peanut and the 64 seems to be in the cards.

This conflict is almost certain never to take the form of a price war similar to that waged and won by Commodore. Especially with the example of Atari, TI, and others, driven into deep shades of red by Commodore, it is unlikely that IBM could be suckered into a fight it could not possibly hope to win. Commodore assembles its computers almost exclusively of company-made parts, up to and including the microprocessors. Most of the parts in the Peanut will come from outside suppliers, many of them in Japan. IBM can only cut so far before beginning to cut into their profits on the machine.

But a nose-to-nose advertising campaign is altogether likely, if and when Peanut and C-64 find themselves the last two warriors on a keyboard-strewn battlefield. How will Commodore fare against IBM in a media war, with each manufacturer touting the merits of its own machine? The burden of proof is on Big Blue, who must convince consumers that the extra $400-$500 they must shell out for the Peanut will be money well spent. Can they do it? Let's consider some of IBM's probable sales pitches and the counterarguments Commodore (or the educated consumer) is likely to supply.

The main selling feature of the Peanut for customers who look beyond the IBM name will be the immediate availability of software programs by the thousands—for most of those developed for the IBM Personal Computer will run with the Peanut. The C-64's main failing point has been the relative scarcity of software, and while the computer's sales success is changing all that, the gap between a 64 owner's selection and a Peanut/PC's is wide and not soon to be bridged—if ever.

But different individuals purchase home computers for different needs. Of the hundreds of programs available for the PC, the average owner may buy—ten? twenty? twenty-five?—in his lifetime? Of the twenty-five programs the average owner may buy, it's likely that twenty-three or twenty-four will be basic, popularly used programs that are available for the 64 as well. Especially since many of the selections in the PC programs library would not serve the typical user, but fill specific technical needs for the engineer, the scientist, and other people who would choose the Peanut or the PC over the Commodore in any event.

Additionally, the majority of software purchases comprise games, of which a greater supply exists for the C-64 than for the Peanut/PC. Considering the price ranges the two systems fall into, that is an advantage that most likely will remain Commodore's.

While the Peanut is not expected to be technologically innovative—IBM has made its reputation by learning from its competitors' mistakes, and combining the best of what its competitors have to offer—the Peanut is certain to have capabilities beyond those of the 64. Like the C-64, the Peanut will feature 64K (expandable to 128K). It will boast a more powerful microprocessor than the Commodore 64 and will feature a 16-bit architecture, compared to 8-bit for the 64. Additionally, it will feature, either at the time of its release or later on, a keyboard that connects to the microprocessor without a cable, but allows the user to sit across his/her den in an easy chair while infrared light transmits the information.

These advantages are, of course, advantages of convenience—not of increased utility. It is up to the

individual to decide—does (s)he want a toaster that will toast a slice in one minute instead of two? Does (s)he want a sewing machine that can be operated from a comfortable seat on the sofa? And how much extra is (s)he willing to pay for these advantages?

It remains to be seen what other advantages the Peanut has over the C-64. Judging from a profile published in L.F. Rothschild's microcomputer review, *Smalltalk,* the two machines are somewhat similar. Their CPU's are similar in size, and both feature unbundled configuration, ROM based disk storage, television quality display resolution, external bus expansion, and color availability. The 64, in fact, may have an advantage over the Peanut in its keyboard—IBM's is not expected to be standard professional style.

Working in favor of Commodore—and all other home computer makers—is IBM's delayed release of the Peanut. It was speculated in early September that Peanut will not be released until 1984—a speculation taken seriously enough to jump Apple's stock 6 3/8 points. And with good reason, for a 1984 Peanut release would leave Apple alone in its sector of the market for the 1983 Christmas season. Customers who go to their computer store planning to spend $1,000 on a Peanut and find none available may settle for a IIe.

Or, they may elect to move down rather than up in price and buy a C-64. And Commodore's matchless production power should prove its most valuable weapon in its competition with the Peanut. IBM, dependent on outside production facilities, has been unable to produce PC's in sufficient quantities to meet the enormous demand—and the same is certain to be true of the Peanut, of which they expect to build only 500,000 between September 1983 and September 1984. Commodore will build two million 64's, many of which will find their way into the hands of would-be Peanut purchasers.

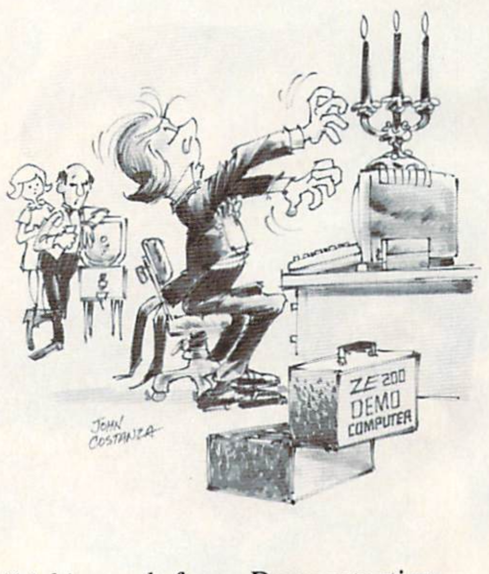
A Commodore spokesman, in fact, claims that the company welcomes the arrival of the Peanut for this very reason. The more interest IBM generates among the public in home computers, through their very presence as well as through their "Peanuts" characters ad campaign, the more new customers will be brought into the market—customers who can potentially opt for a 64 instead of a Peanut.

But in an oscillating industry like home computers, too much attention must not be focused on a single rival, no matter how formidable. The previously mentioned investment firm of L.F. Rothschild predicts that the main forces in the field for the next two years to come will be IBM, Apple, Commodore, the Japanese (of course) . . . and what seemed for a while to be the most serious challenge to Commodore's standing as king of the bottom of the hill: Coleco, and its Adam.

On paper, the Adam package offers more computer for the dollar than any other system on the market. It will retail in the $600-$700 range and include an 80K computer with stepped keyboard and two ColecoVision-type joystick controllers, highspeed tape drive, letter-quality printer, built-in word processing, and a *Buck Rogers* game.

But since Adam's unveiling in June, indication has piled on top of indication that the package is not the bargain Coleco would have us believe—nor the bargain Coleco at first believed. Two months were spent correcting problems in the memory drive. The built-in wordprocessor, a *Wall Street Journal* reporter wrote, lacked some important editing functions and couldn't perform some others easily enough, and will be supplemented sometime next year with a "utility pack" costing around thirty dollars. The daisy-wheel printer, insiders claim, was slowed from forty to ten characters per second because it self-destructed at the higher speed. Even after the slowdown, problems surfaced that gave Coleco cause for further eleventh-hour retooling.

Continued on page 90



"A bit much for a Demonstration, wouldn't you say?"

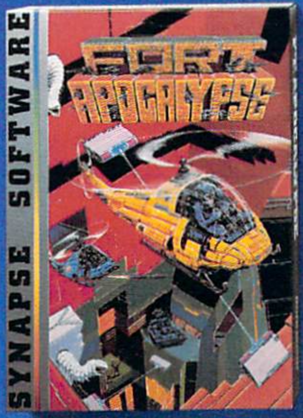

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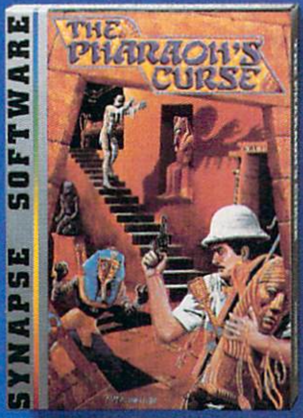
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Reader Service No. 22

RUPERT REPORT

Don't Curse That Cursor! Learn To Put It Where You Want It.

The Commodore-64 is an impressively powerful machine but sometimes even elementary operations require a fair amount of head-scratching and ingenuity.

In this inaugural column I will share the results of some of my head-scratching. Then it's up to *your* ingenuity to find ways of applying these results to your programs.

The Apple has VTAB and HTAB commands to position the cursor. The TRS-80 has a PRINT command and the IBM uses a LOCATE instruction. But what about the C-64? We'll look at several ways of positioning text and graphics on the screen. First we'll see what BASIC has to offer. Then we'll delve into assembly language.

Type and run this short program:

```
 5 PRINT CHR$(147) : REM CLEAR SCREEN
10 FOR C = 65 to 90 : REM A = 65; Z = 90
20 PRINT CHR$(C)
30 FOR PAUSE = 1 to 50 : NEXT
40 NEXT C
```

It prints the letters of the alphabet vertically down the left side of the screen. To print them horizontally across the top of the screen instead, put a semicolon at the end of line 20. A comma at the end of line 20 puts the output into four columns. That is easy enough

But how about printing the alphabet vertically down the center of the screen? That will take some doing. One way is to modify line 20 so it reads:

```
20 PRINT TAB(20) CHR$(C)
```

The TAB function is similar to the tabulator key on a typewriter. The cursor is moved over to column 20 before the next letter is printed. Now experiment with a comma or a semi-colon at the end of line 20. Can you explain the results? Remember that the TAB(20) function moves the cursor to column 20 only if it is not already past that column. Otherwise printing continues from the current position.

So do you think you know everything there is to know about TAB, commas, and semi-colons in PRINT statements? Then try this simple program and see if you can explain its output. You're on your own! (Why isn't the number 20 in the 20th column??)

```
10 FOR N=1 to 50
20 PRINT TAB(N) N;
30 NEXT N
```

The SPC(X) command looks similar but is actually quite different from the TAB(X) command. For example PRINT "GOING" SPC(3) "GONE" puts three spaces between the two words. Replace SPC with TAB and the two words are printed side by side.

TAB(X) always counts from the left end of the current line. SPC(X) counts over X spaces from the present cursor position. In both cases X ranges from 0 to 255 for output to the screen.

The problem with SPC and TAB is that they are very line-oriented. If you are interested in positioning things anywhere on the screen, either would be very cumbersome. Even with the help of the POS command to tell where on the line the cursor is, vertical movement of the cursor is difficult.

A technique which is more screen-oriented involves the cursor control characters. The following program shows the method.

```
5 REM RANDOM BUTTERFLY USING CURSOR
CONTROLS
10 C$=CHR$(147):U$=CHR$(145):D$=CHR$(17)
20 L$=CHR$(157):R$=CHRS(29)
25 PRINT C$ : REM CLEAR SCREEN
30 X = RND(1)*(127-37) + 37 : X$ = CHR$(X)
40 FOR N =1 TO 20:PRINT X$ D$ ; : NEXT
50 FOR N=1 to20:PRINT U$ L$ X$ ; : NEXT
60 FOR N=1 to 19:PRINT D$ L$ L$ X$ ; : NEXT
70 FOR N=1 to 20:PRINT L$ U$ X$ ; : NEXT
80 GOTO 30
```

The characters defined in lines 10 and 20 represent the SHIFT-CLR/HOME, CRSR UP, CRSR DOWN, CRSR LEFT, and CRSR RIGHT respectively. Line 25 clears the screen. X is given a random value between 37 and 127. Then X$ is defined as the character with that value in line 30.

Line 40 repeatedly prints X$ at the current cursor position then moves the cursor down. (Note that in printing X$, the cursor was automatically moved to the

By Dale W. Rupert

right.) Consequently a diagonal line of X$'s is printed. Line 50 moves the cursor up and left, then prints X$. This generates the upward vertical line. Similarly line 60 draws the next diagonal line. Then line 70 draws a vertical line, bringing us back to the start, almost. Line 80 causes the whole thing to be repeated with a different character.

Granted, the cursor control characters could be put directly into the PRINT statements inside of quotation marks. That's fine for occasional cursor manipulation. Using variables as above is far more convenient, however, for both reading and editing.

The cursor control CHR$ codes are listed in Appendix F of the *C-64 User's Guide* and Appendix C of the *Programmer's Reference Guide.*

All the techniques discussed so far have one significant constraint. They all move the cursor *relative* to its current position or to the left end of the screen line. As we've just seen, that is fine for setting up columns of data and for graphics animation. What we really need is a way to position the cursor at some *absolute* location on the screen.

There are at least two ways of putting a character anywhere on the screen. One involves POKEing the character value directly into the screen memory. The procedure is discussed on pages 62-64 of the *C-64 Users Guide.* The screen is seen as a grid of 40 columns (numbered 0-39) and 25 rows (numbered 0-24). Each cell in the grid has a memory location associated with it. The memory location is given by the formula MEM = 1024 + COLUMN + 40*ROW. The MEM values range from 1024 in the upper left hand corner of the screen to 2023 in the lower right hand corner.

The screen poking method is handy for graphing as the following program shows.

```
1 REM GRAPHING - USING SCREEN POKES
10 PRINT CHR$(147) : REM CLEAR SCREEN
20 FOR X = 0 to 39
30 Y = INT ( 10 * SIN ( X / 3) ) + 10
40 MEM = 1024 + X + 40 * Y
45 IF MEM < 1024 or MEM > 2023 THEN 60
50 POKE MEM , ASC(" * ") : POKE MEM +
54272 , 1
60 NEXT
```

In this program, X is stepped across the screen. The corresponding value of Y is calculated in line 30. The memory location for the X,Y pair is found in line 40. Finally, the code value for an asterisk (character 42) is POKEd into that memory cell in line 50. Note also that the color of the memory cell is defined by POKEing a value of 1 into color memory. Color memory locations are 54272 higher than the corresponding screen memory values.

You may change the definition of Y in line 30 if desired. Be careful though. The value of Y must be between 0 and 24 or you will be POKEing into areas other than screen memory. And that can be bad news!

What does happen if you POKE into a memory location that you shouldn't? The worst that can happen is that the computer will "freeze up". Nothing permanent, mind you. All you have to do is to turn power off. Wait about fifteen seconds (for the circuitry to discharge). Then start over from the beginning.

It's always an excellent idea to save any program (especially those containing POKEs) *before* you run it. Get in the habit. Adding line 45 above may seem like too much work, but lose an hour's worth of typing some time and you'll think differently.

One characteristic of the screen poking method just described is that it does not affect or update the cursor. That is no disadvantage for graphing. For other applications, it is handier for the computer to keep track of the cursor.

That brings us to the final method of positioning objects on the screen. It will involve some assembly language programming. Whether or not you are interested in learning assembly language, the results will be useful.

On page 290 of the *Programmer's Reference Guide* is a description of the kernal function called PLOT. PLOT is a routine that can be used to put the cursor at any specified location on the screen. That's just what we need. Unfortunately PLOT is not a BASIC command. Let's see how to use it anyway.

An adaptation of the example at the bottom of page 290 gives some help:

```
;MOVE THE CURSOR TO ROW 0, COLUMN 0
(home)
LDX #0
LDY #0
CLC
JSR PLOT
RTS
```

It looks a bit mysterious, perhaps. But if you're ready for a good adventure, here goes.

LDX and LDY are symbols (mnemonics) for LOAD REGISTER X and LOAD REGISTER Y. The registers are similar to the memory in a calculator. The # signifies that the following number is to be loaded into that register. Thus zero is loaded into register X and zero is loaded into register Y. CLC means "Clear the Carry bit". JSR PLOT is just like the GOSUB statement in BASIC. In this case, PLOT is the name of the subroutine being called. RTS means Return from Subroutine.

We must store these instructions in the computer's

memory, and then cause the computer to execute them. According to the description of PLOT, the cursor will then be situated at row 0, column 0.

The instructions are stored in memory as numbers. We must find the numerical value for each instruction. Have a look at the table on page 416 of the *Programmer's Reference Manual.* There you will see LDX, LDY, CLC, JSR, and RTS. The "#" in LDX #0 and LDY #0 signifies the Immediate Addressing Mode. From the table, the value for LDX (Immediate) is A2 (in Hexadecimal). LDY (Immediate) is A0. Values for CLC, JSR (Absolute), and RTS are 18, 20, and 60 (all in Hex). That's all we need from the table.

Here is a translation from the Assembly Language mnemonics to Hex values:

LDX #0	A2 00
LDY #0	A0 00
CLC	18
JSR PLOT	20 F0 FF
RTS	60

The zeroes are written as two digits for uniformity. The RTS is needed in order to return to BASIC from our assembly language program. All the other numbers above should be obvious except for the F0 and the FF. (If not, reread the previous paragraph.)

From the description of PLOT, it is a subroutine which resides at Call Address $FFF0. The $ simply means that the number is written in Hexadecimal. The computer expects to find the address of the subroutine it is calling in the two numbers following the JSR (20) instruction. The address FFF0 is broken into two parts, the Most Significant Byte (MSB), and The Least Significant Byte (LSB). The LSB (F0) is always stored first, followed by the MSB (FF). That's where the 20 F0 FF comes from.

Now one more translation gives us something we can use in BASIC:

A2	00	A0	00	18	20	F0	FF	60	(Hex)
162	0	160	0	24	32	240	255	96	(Decimal)

The first row contains our hex values. The second row lists their decimal equivalents. We must store these numbers somewhere in memory. The *Programmer's Reference Manual* on page 309 recommends using memory addresses from $C000 thru $CFFF (49152 thru 53247 in decimal). Believe it or not, we're finally ready to do just that.

The program in Listing 1 shows how to put the machine language data into memory. It also shows how to use the PLOT routine.

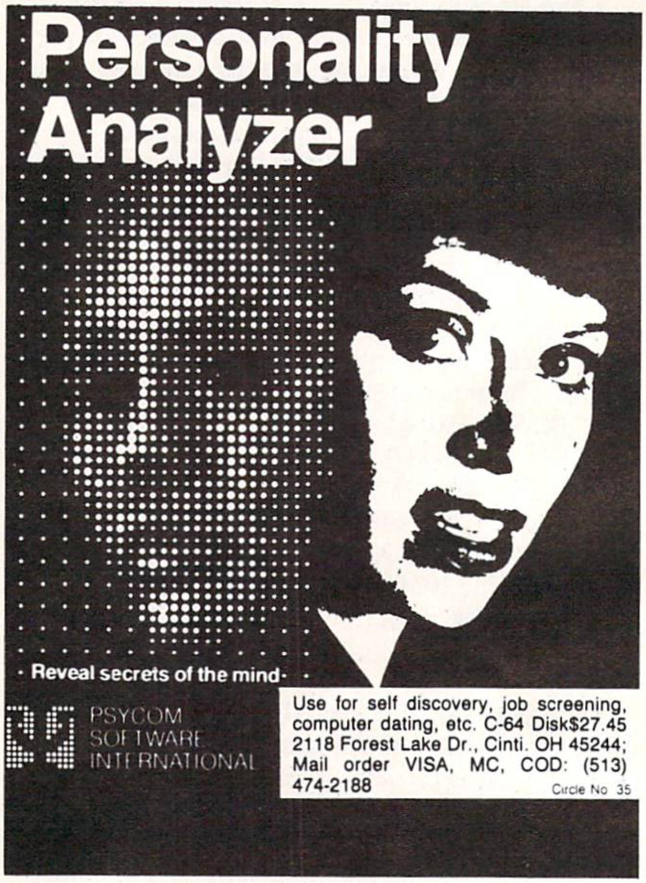
In Listing 1, lines 5 thru 50 put the decimal values of our machine language routine into memory locations starting at 49152. Lines 100 thru 140 define the variables ROW and COL then call (GOSUB) the subroutine starting at line 1010.

Notice that the zero which is loaded into register X will reside in memory at address SA + 1 (or 49153) and the zero to be loaded into register Y will be in address SA + 3 (or 49155). Consequently to have the computer load values other than zero into the X and Y registers, we must first poke those values into addresses SA + 1 and SA + 3 respectively. That is what line 1020 does. The SYS SA statement causes the computer to call the machine language routine beginning at memory location SA (49152). That's where our routine is stored.

The subroutine starting at line 1010 could be used in any of your programs after lines 5 thru 50 have been executed. Call it just as was done in line 130 to put the cursor wherever you want it.

Now there's no need to curse the cursor. Control it instead!

SEE PROGRAM ON PAGE 89



Reader Service No. 23

COMMODARES

Each month we will present short utility programs and a programming problem or two. You are encouraged to solve the problem and send us your solutions. The cleverest or simplest or shortest or most unique solutions will be discussed in future columns. So brush up on your programming skills and let's go.

SQUARE NAME.

The user types a name into the computer. The computer prints the name four times so that the four names form a square.

—*Dale Rupert*

```
 BETTE
B     B
E     E
T     T
T     T
E     E
 BETTE
```

CROSSED NAME.

The user types a name into the computer. The computer prints the name along two diagonals from upper left to lower right and from upper right to lower left on the screen.

—*Dale Rupert*

```
EVA       EVA
 EVA     EVA
    EVEVA
     EVA
    EVEVA
 EVA     EVA
EVA       EVA
```

VIC TALKER (for the VIC 20)

Following is a little program that talks through your VIC. By reading a normal audio tape, your TV will reproduce the tape pretty well. Sure, there will be some fuzziness, but if you want the best possible results, hook up a separate speaker and amplifier.

Remember, while the program is running, keep the play button down on your VIC tape recorder. To stop the program, simply press the STOP key.

Also, note the hex to decimal conversion from 190-220. A in. A out. Saves memory.

—*Pete Lobl*

```
10 REM LOCATIONS 828 AND 829 CONT
ROL HOW LONG THE VIC WILL SPEAK F
OR.
20 REM THE HIGHER THE NUMBERS, TH
E LONGER THE TIME.
30 REM USE THIS ROUTINE IN YOUR O
WN PRORAMS. SYNCHRONIZE IT WITH I
NSTRUCTIONS
40 REM OR PROGRAMS FOR VERBAL EFF
ECTS !!!
50 REM PROGRAM IS ONLY CLICKING S
PEAKER EVERY TIME A TRANSITION IS
 DETECTED
60 REM ON THE TAPE. SINCE IT MOVE
S SO FAST IT GIVES THE ILLUSION O
F SPEECH.
70 REM TRY USING A GOOD AMP AND S
PEAKER, IT SOUNDS MUCH BETTER !!!
80 REM MUSIC SOUNDS A LOT BETTER
THAN SPEECH !!!!!!
90 POKE36879,27
100 PRINT"{SC}{CD}{CD}{CL}MAKE SU
RE TAPE IS IN, AND PRESS PLAY"
110 PRINT"{CU}WHEN I TELL YOU ."
120 FORI=830TO933:READA$:GOSUB190
:POKEI,A:NEXT
130 FORI=942TO982:READA$:GOSUB190
:POKEI,A:NEXT
140 PRINT"{CU}{CU}PRESS PLAY ON T
APE..."
150 POKE828,1:POKE829,1SYS942
160 POKE828,127:POKE829,25:SYS830
170 END
180 REM HEX TO DECIMAL CONVERTER
190 B$=LEFT$(A$,1):C$=RIGHT$(A$,1
):IFASC(B$)>64THEN200
195 B=VAL(B$)*16:GOTO210
200 B=(ASC(B$)-55)*16
210 IFASC(C$)>64THEN220
215 A=B+VAL(C$):RETURN
220 A=ASC(C$)-55+B:RETURN
500 DATA48,98,48,8A,48,A9,02,8D,2
E,91,A9,FC,8D,1C,91,AD,0E,90,29,F
0,8D,0E,90
510 DATAAD,2C,91,29,FE,8D,2C,91,A
9,00,AA,A8,20,DB,FF,20,DE,FF,EC,3
C,03,90,05
520 DATACD,3D,03,B0,2A,AD,2C,91,4
9,01,8D,2C,91,A2,40,A0,00,A9,02,8
D,2D,91,2C
530 DATA2D,91,D0,08,88,D0,F8,CA,D
0,F5,F0,D5,AD,0E,90,49,0F,8D,0E,9
0,D0,CB,F0,C9
```

```
•540 DATAA9,FE,8D,1C,91,68,AA,68,A
A,68,60
•600 DATA48,98,48,8A,48,A9,00,AA,A
8,20,DB,FF,A9,FC,8D,1C,91,20,DE,F
F,EC,3C,03
•610 DATA90,F8,CD,3D,03,90,F3,A9,F
E,8D,1C,91,68,AA,68,A8,68,60
```

DATA MAKER FOR VIC-20 and C-64.

This second program, for both the VIC and the C-64, performs the simple but time-consuming task of automatically making data statements. You specify the memory to be transferred to data, the starting line numbers, and how many total lines there will be. Then it's off to the races as your computer will chug out lines faster than you can manually. Thanks to the keyboard buffer, all this is relatively simple.

Uses for this include: transferring ML to basic DATA, putting SPRITE values from memory into DATA, and saving music in DATA . . . among countless other uses.

—Pete Lobl

```
•100 REM LINE 50000 GETS THE START
ING LOCATION FOR ENTRY OF DATA
•110 REM LINE 50010 GETS THE START
ING LINE NUMBER
•115 REM LINE 50015 GETS THE AMOUN
T OF LINES TO BE ENTERED
•200 REM THE INCREMENT FOR EACH SU
CCESSIVE LINE (NOW 1) IS IN 50060
 (LI=LI+1)
•250 REM THERE ARE 18 PIECES OF DA
TA STORED ON EACH LINE, SO IF YOU
 WANT TO KNOW
•260 REM HOW MANY LINES YOU'LL NEE
D, SIMPLY DIVIDE THE AMOUNT OF DA
TA BY 18
•5000 INPUT"{SC}LOCATION ";A:POKE8
29,INT(A/256):POKE828,A-INT(A/256
)*256
•50000 INPUT"{SC}LOCATION ";A:POKE
829,INT(A/256):POKE828,A-INT(A/25
6)*256
•50010 INPUT"LINE NUMBER ";A:POKE8
31,INT(A/256):POKEK830,A-INT(A/25
6)*256
•50015 INPUT"# OF LINES ";A:A=A+PE
EK(830)+PEEK(831)*256
•50016 POKE833,INT(A/256):POKE832,
A-INT(A/256)*256
•50020 A=PEEK(828)+PEEK(829)*256:L
I=PEEK(830)+PEEK(831)*256
•50030 IFLI>PEEK(832)+PEEK(833)*25
6-1THENEND
•50040 PRINT"{SC}{CD}{CD}{CD}"RIGH
T$(STR$(LI),LEN(STR$(LI))-1)"DATA
";
•50050 FORI=1TO17:A$=STR$(PEEK(A))
:PRINTRIGHT$(A$,LEN(A$)-1)",";:A=
A+1:NEXT
•50060 A$=STR$(PEEK(A)):PRINTRIGHT
$(A$,LEN(A$)-1):A=A+1:LI=LI+1
•50070 POKE829,INT(A/256):POKE828,
A-INT(A/256)*256
•50080 POKE831,INT(LI/256):POKE830
,LI-INT(LI/256)*256
•50090 PRINT"GOTO50020"
•50100 PRINT"{HM}";:POKE198,3FORI=
631TO636:POKEI,13:NEXT:END
```

MOE RON LEE

Moe Ron Lee, that brilliant exchange student, surely has his work cut out for him this time. His Computer Science teacher gave him a program to repair, but poor Moe can't seem to locate any errors. Help Moe!

There are five glaring errors in this short but sweet root calculating program. There are an infinite number of solutions, but they're not as easy as you might think. Try it, see if you can outdo that star of the keyboard, Moe Ron Lee!

—Pete Lobl

```
•10 ST=5:GO=30:T=10
•20 FORI=STTOOGOSTEPPLUS5
•30 PRINT#I,SRQ(I),ITIMESTAND100;R
EM HELLO
•40 READA$,B:A=VAL(B$)+I:PRINTI-A_
2,A$
•50 NEXT:PRINTCHRSTRING(14)"GOOD S
HOW, YOU BEAT MOE !!":END, PLEASE
•100 DATUMWHAT,ONE,IS,TWO,THE,THRE
E,PROBLEM,FOUR,HERE,FIVE,PRINT,SI
X
```

This is how it should read:

```
 5          2.23606798      32
-20         WHAT
 10          3.16227766      100
-90         IS
 15          3.87298335      4
```

```
-210            THE
 20             4.47213595        64
-380            PROBLEM
 25             5             96
-600.000001          HERE
 30             5.47722558        36
-870            ?
GOOD SHOW, YOU BEAT MOE !!
```


BASIC

BASM

ASSEMBLY

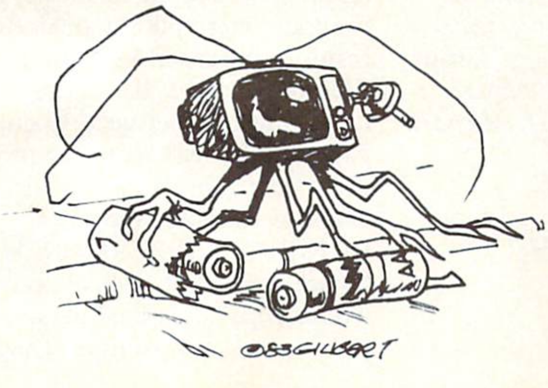
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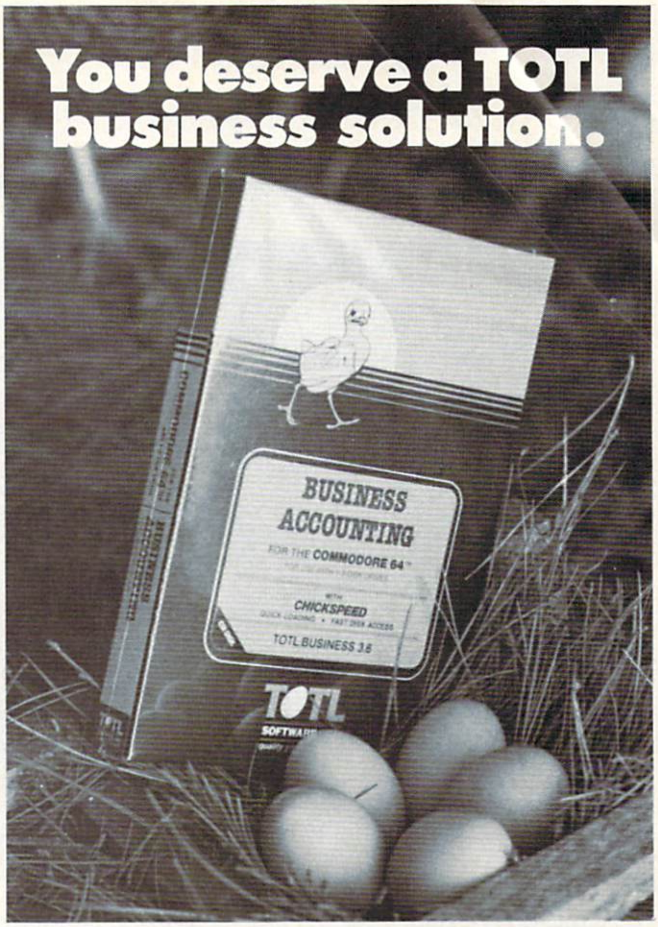
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- Are you fed up with having to kludge binary into your program?
- Are you fed up with being unfamiliar with assembly?
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- **No more awkward binary segments:** BASM handles both BASIC and assembly!
- **Learn assembly language by example:** BASM can list the assembly generated by your BASIC statements!

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KEYWORD CROSS REFERENCE
RESEARCH ASSISTANT

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ASTROBLITZ

Creative Software for the 64, VIC
Cartridge; joystick
Graphics: C
Gameplay: D

All that needs be said about *Astroblitz* is that it is another in a long line of bad knock-offs of *Defender.* You've seen it before: you streak above the city and shoot down attacking craft. Some of the craft are amusing graphically—like galactic carny targets. What is not amusing is the sluggish response of the ship to the joystick controls. I found myself blubbering like Han Solo: "It's not my fault!" as I blew up time after time. Save your money. There are better games out there.

—R.J. Michaels

FORT APOCALYPSE

Synapse Software for the 64
Tape, disk, cartridge; joystick
Graphics: A
Gameplay: A

Another in a series of attack-and-rescue/shoot-and-navigate games, *Fort Apocalypse* is just good enough to merit a recommendation. The glittering graphics and serpentine paths of the fortress are involving, attractive. The game's pace is neither too brisk nor too leisurely.

The player is challenged to pilot a spacecraft into the depths of a cavern network, to release the men imprisoned there and, ultimately, to destroy the cavern complex. Opposition forces are the sinister Kralthans with their tanks, floating mines, and copters. To further impede the player's progress are impact shields, access doors, and laser chambers.

The primary attractions of this game are the ongoing sense of discovery as more and more areas of the fort are revealed, and the variety of tasks—blasting, rescuing, navigating, refueling. A handsome diversion from Synapse.

—R.J. Michaels

KEYWORD CROSS REFERENCE (TOTL RESEARCH ASSISTANT 2.0)

TOTL Software
C-64

When I finally figured out what this program was all about, I was quite enthused. After going through the 21 page manual a couple of times and pondering the single example on the last page, I realized that what I held in my hands was a replacement for all those index cards I used to fill out in the school library as an undergraduate. This program would replace all the card shuffling and sorting with a computerized cross reference list. It seemed to be just the thing to take care of a project I had been putting off for some time, the organizing of my computer magazine library by issue, subject and author.

The package consists of two programs written in BASIC. The first program, *RA.Build,* is about 15 kilobytes long and handles all the input and output functions. It is actually a specialized word processor and report generator. The second program, *RA.Xref.Build,* is about 6 kilobytes long and generates a cross reference list based on the source files and keywords you input into the *RA.Build* program. More on this later.

The program outputs the cross reference list to disk for reading and printing by the *RA.Build* program. Since both programs are written in BASIC the user must exercize some caution not to hit the STOP key. Doing so will interrupt the program with a possible loss of data. Since the programs interact with the disk drive on an almost continous basis, a program interruption would also result in improperly closed disk files and a loss of data. The manual talks about what to do for various interruptions to the program operation. Under no circumstances should the RUN/STOP and RESTORE keys be pressed simultaneously as this would wipe all entered data.

To try out the package, I pulled

a couple of back issues off the shelf, loaded the *RA.Build* program and proceeded to enter all the Commodore-related articles with brief descriptions. The program is actually set up to treat the input data as a book or article with title, author, keywords, page numbers and dates. To start with, a 'Source' number between 1 and 9999 is assigned to the particular reference work. The program then prompts for author, title, and bibliographical data. All this is entered in free format form.

The standard Commodore editing features are fully supported, although they tend to run a bit slower, being under BASIC control. This particular set of titles did not quite suit my needs and there was no way to change them under program control. I decided to forge ahead and make do. It should be a fairly simple matter to customize the BASIC program to suit a particular need. The data was easy to enter with plenty of program prompts and brief menus to guide the user.

After the source data is entered, the user has the option to verify and correct it. The quit option deletes the data which was just entered. The save option stores the data in an internal buffer. When 256 characters are entered the buffer is written out to a sequential file on disk or tape. This procedure is repeated for the entire data entry process and the disk activity light will always be on. After the source data, the user enters the reference data starting with a reference number from 1 to 9999. After the first reference number, the program sequentially assigns succeeding reference numbers. The source and reference numbers are the key to the program's output. The cross reference list uses these numbers in the format of xxxx.yyyy, where xxxx is the source number and yyyy is a corresponding reference number. The program then requests the entry of page numbers in free format. These should be entered in a consistant format for best results.

The bulk of the data is in a comment block up to 1020 characters long. This data is actually entered and displayed in four blocks of 255 characters each although it is treated as continuous text. It took a little getting used to watching the entire text disappear when the 256th character is typed, although the procedure seemed to work without a hitch.

Following the comments are the keywords. These would be carefully selected and consistent in spelling, including capitals, as they form the basis of the cross reference list. Up to twelve keywords may be associated with each reference. Each keyword could be up to 40 characters long. To provide an author cross reference list, I entered the author's last name as a keyword for each article. To list the authors in a separate group, the first letter of each name was capitalized. All other keywords were lower case. The user should keep in mind the order in which keywords are sorted when making up the list. The sorting hierarchy is: first, the normal space followed by numbers; then, lower case letters and upper case letters with the shifted space last. The last data items are the 'from' and 'to' dates, both of which are optional. After data entry is complete, the same review, edit and save procedure goes into effect as described above.

The completed file is used by the *RA.Xred.Build* program to create the actual cross reference file. The program stores the file on disk for use by the *RA.Build* program in printing out. The entire procedure is somewhat cumbersome as it involves three separate loadings of the program.

First the *RA.Build* program is used to create and print out the source reference file. The second step requires that the *RA.Xref.Build* be loaded and run to create the cross reference file. The program must also be used to browse through the cross reference list by keyword.

The creation of the cross reference file is a rather lengthy procedure. The test case I set up consisted of two magazines with fifteen reference articles in the first issue and ten reference articles in the second issue. The number of keywords in each reference ran from two to eight. The creation of this reference file took approximately seven minutes. The reference file is created in memory and is limited in size by the available RAM. This particular example used 54 slots out of the 502 available and 619 memory out of the 6227 available. Thus it was not a particularly long list. A significantly larger list may allow you to eat your dinner or watch a late movie while it sorts.

The final step requires that the *RA.Build* program be loaded back into the computer. This program is then used to print out the keyword cross reference file. It was at this point that I ran into my first major difficulty. In spite of several attempts, the program would abort with a "STRING TO LONG ERROR IN 3250" at the second keyword on my list. Thus I was not able to generate a final keyword cross reference listing. This seemed rather odd as the program is well structured to prevent improper data entry and I was able to browse through the keyword file using the *RA.Xref.Build* Program.

Overall, this looks like a very

interesting application for the Commodore 64. With a few minor enhancements and the addition of the company's Chickspeed machine language subroutines to speed up some of the slow portions of the program, it would be worth its $35 price. I was disappointed not to get the final keyword cross reference listing.

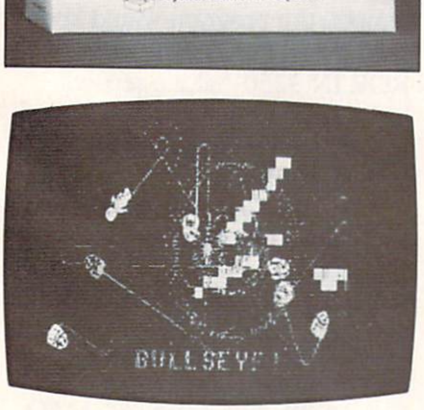
—Morton A. Kevelson

MOONDUST

Creative Software for the 64, VIC
Cartridge; joystick
Graphics: B
Gameplay: A

And now for something completely different. You have never seen anything like *Moondust*, no matter how many games you've played this year. No mazes, no nuke the alien agressors, no 'find ring, sit on ring'—designer Jaron Lanier has created a unique work.





As such, it is not for everybody. Players shopping for a non-violent game that incorporates graphics and music will want to consider *Moondust*.

The player controls a spaceman who is floating craftless in an energy field in space. The spaceman's movements are duplicated by a number of spacecraft. The object (am I losing you?) is to direct the spaceman to direct the ships to maneuver over a flashing cursor (or space seed); a trail of moondust will then be created which the player/moonman must direct across the heart of the energy field. (Look, the instructions for this game are confusing. Even the people at Creative Software didn't know what Lanier was up to.)

Some will find this game pointless or maddening, others will become addicted. Some may be driven to run screaming from the room on account of the truly spacey music (which is also controlled by the player), others will be lulled into ecstasy by it. This game takes full advantage of the graphics and musical capabilities of the 64. And, although it is not the type of game you'll play for hours, I recommend it.

—R.J. Michaels

SPEED RACER

T&F Software for the 64
Disk; joystick
Graphics: D
Gameplay: D–

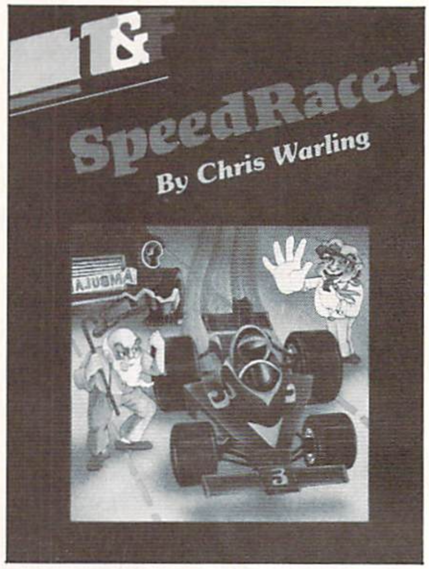
The object of *Speed Racer*, not surprisingly, is to drive down a crowded freeway avoiding pedestrians, potholes and other vehicles. Points are accrued based on mileage and the number of objects avoided within a time limit.

The graphics here are so simple that I nearly fell asleep at the wheel. At the slower speeds the game is uninteresting, and at the faster speeds the playfield whizzes by in a blur: so fast, in fact, that there's no challenge—just crash after crash.

Confession: this game became so tedious that, to liven things up, I began to deliberately run over pedestrians. (When hit, they leave a messy red stain on the tarmac.)

This disk deserves to be run over; it too is pedestrian.

—R.J. Michaels

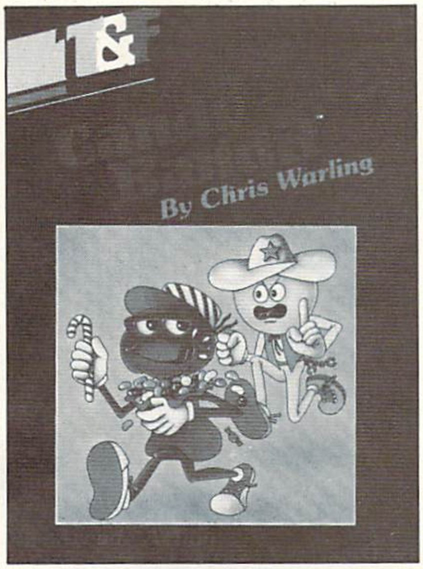


CANDY BANDIT

T&F Software for the 64
Disk; joystick
Gameplay: F
Graphics: F

This might have made an interesting videogame, though I doubt it. Both the graphics and the gameplay are absurdly simple. Ditto the scenario: the gamer is the bandit and the computer-driven sheriff is chasing him through a maze while the bandit gobbles up various goodies.

The one good feature of this game (and it is a small one, so pay attention) is that it is not a *Pac-Man* knockoff, much as it sounds like one. Rather than a true maze, *Candy Bandit* provides a series of five horizontal lines that split the screen. These lines scroll past the



points to form a doorway. While this may sound like fun and cleverness, there are two drawbacks:

First, if the bandit touches a wall he sticks to it. He is unable to free himself until a door passes by and he drops through the opening . . . usually to get stuck on the opposite wall. The average player will spend most of his/her time sticking to walls.

Second, the sheriff is not restricted by the laws that apply to the bandit; not only can he touch the walls, he can go through the walls. He ignores due process as well. The sheriff simply moves inexorably toward the bandit; there is no way to stop him. Mostly, the player is stuck to a wall and the sheriff captures him or her. Game.

There is no excuse for the poor quality of design and execution in *Candy Bandit.* This reviewer has played games on the Atari 2600 that are far superior to this all day sucker.

—R.J. Michaels

MAILING LIST AND LABELS (TOTL. LABEL 2.6)
TOTL Software
C-64

Totl.Label 2.6 is a reasonably priced mailing list and label generator program that does a reasonable job. This particular version has been enhanced by the addition of the company's "Chickspeed," a set of machine language routines for speeding up some of the key operations of the program.

Loading is accomplished in two parts to allow the user to easily make backup copies. The procedure for doing this is detailed in the manual. Although many of the features of a good mailing list program are included, the specific implementation of these features leaves something to be desired. The program is designed to generate mailing labels in a user defined format as long as the total number of characters in the label does not exceed 244. The user selects the number of lines and the number of characters per line. Typical formats could be six lines of 40 characters or eight lines of 30 characters. The first line is used for sorting the list and should be carefully formatted by the user. More on this later. The program supports tape and disk files and a variety of printers other than the VIC-1525. The well written 25 page manual is easy to follow but it leaves out or misrepresents the operation of some of the program's features. The program capacity on the Commodore 64 is from 100 to 200 labels depending on the number of characters actually entered into each label.

Entering new data is simple and straightforward with the program prompting the user by line number. All the usual Commodore editing keys are supported, making corrections easy as long as you stay on the same line. Once the line is entered things sre not so easy. If a line is accidentally skipped, say line two of a six line label, and if the error is not noticed immediately, there is no line insert mode to correct the omission. Lines two through six have to be completely retyped leaving line two blank. This could happen if a line is left blank for entry of future data, a procedure necessitated by the way the labels are printed. Only leading lines can be suppressed on printout. This requires all identifying data, comments, account numbers, etc. to be placed on the first lines with actual name and address data on the last lines.

Correcting a label once it is entered into the list is also something of a chore. In order to recall a label for editing, the user must enter enough of the first line exactly as originally entered to uniquely identify the label. If two labels have the same first line the program will only return to the first one. The only way to access the second label is to change the first line of the first label. This procedure was particularly annoying as the program has a rather nice "browse" features which sequentially numbers and displays the first line of each label in groups of twenty. The full label can be called for review or marked for printout by the label number. It would have made a lot of sense to use these same numbers to call up a label for editing.

The first line of each label is used to sort or alphabetize the mailing list. This is the program's most powerful feature. It is also the point on which the manual really flubs. Although nearly two pages in the manual are devoted to the sort feature, the ability to sort by any part of the first line is not mentioned. Fortunately, this feature becomes obvious when the program prompts for the number of the first and last character positions on the line for a sort.

To illustrate this feature and to put the program through its paces I set up a wedding guest list. The first line was formatted as follows:

aa bb name

where *aa* is either *br* bride or *gr* groom and *bb* is either *re* for relatives or *fr* for friends. The name field is obvious. Sorting this list by the entire line would first list the bride's guests followed by the grooms guests. The list would be further subdivided into friends and relatives and finally each subgroup would be alphabetized by name. If the sort was specified to start with column four, an alphabetized list of friends and relatives would be generated. Starting with column seven would alphabetize by name. Unfortunately, this arrangement makes editing labels difficult. To call up a specific label, the first six characters, including blanks, with enough of the name to uniquely identify the label would have to be entered. Putting the bride, groom, relative and friend designators at the end of the line would lose the ability to generate alphabetized lists by these categories. This points out the program's inability to sort by more than one field, which is a desirable feature.

The program's major flaw is that it allows the user to halt the program by hitting the stop key. The manual actually condones this procedure as the only way to change key output parameters such as the size of the label or the screen width for 80 column adapter boards. Key parameters of this sort should be handled under program control. Allowing an inexperienced user direct access in this fashion is only courting disaster resulting in loss of data in memory at best and improperly closed disk files at worst.

The program is written entirely in BASIC with the exception of the machine language routines mentioned earlier. The manual includes some suggestions on how to modify the BASIC portion to suit your own needs.

Overall, this is a simple label generator and sorting program suitable for most home applications. It is rather limited as a business package particularly in a multiuser environment. The program does function rather competently after the user adjusts to its various limitations.

—Morton Kevelson

SUSPENDED

Infocom
Commodore 64
Disk

"My systems are failing" was the message. I knew that it was serious: as screwy as the enigmatic little robot was, he wouldn't send an Interrupt Alert without good reason. Still I was busy elsewhere; several hundred citizens were dying, seismic eruptions were playing hob with the complex and it was my responsibility to repair the damage

"That robot is no longer functional" the filtering computer coldly informed me when I got around to asking for a location report. Dead. The little fella was gone.

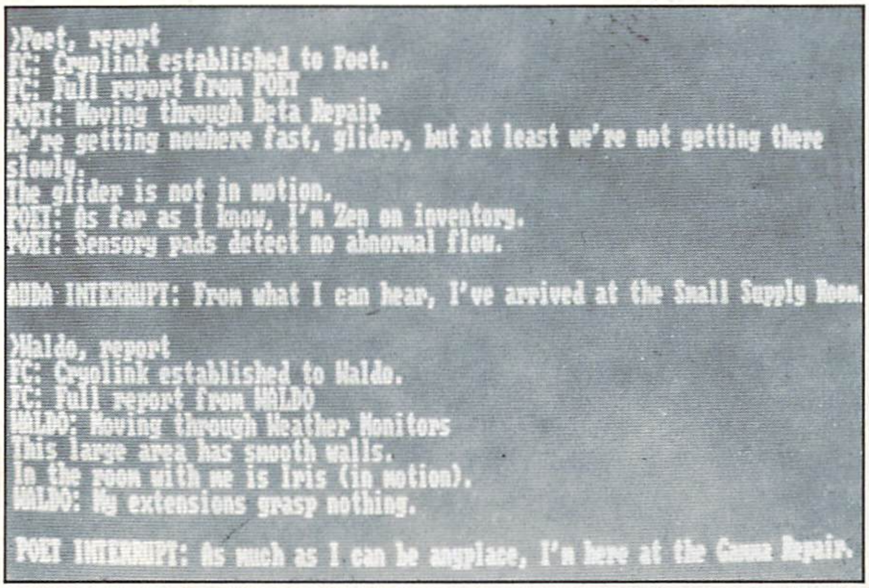
The dysfunction of a solitary conglomeration of metal, wires and high impact plastic should not have disturbed me as much as it did, but this was Poet. No longer would I be treated to his nonsensical ramblings punctuated with dollops of common sense, his robotic wit, and his slightly skewed way of viewing the world. Losing Poet was bad enough, but, in addition, Iris was blind and Waldo was not sure how to repair her, Auda was sensing intruders in the Sterilization Chamber, and breaks were detected in the Maintenance Access. Whiz might have been able to help me solve my mounting problems . . . if only he were plugged into the correct pedestal.



In grief and despair I quit the game. Cyro-life was not worth living without Poet. Perhaps he could be repaired; but did Bambi repair his mother? It was just a warm-up round anyway; winning Infocom's *Suspended* is a marathon that requires conditioning.

Unless you've been in cryogenic freeze yourself for the last year or so, you're aware that Infocom's games are totally textual, or "participatory novels" as some have dubbed them. We're fortunate that the first practitioners of this new art form are polished, intelligent, witty, and imaginative as, for example, Michael Berlyn is. Berlyn is the author of *Suspended,* and he has lavished a good deal of complexity and eccentricity into his game. I recommend it. Further, in my judgement, no intelligent gameplayer's collection is complete without at least one Infocom game.

In *Suspended,* you take the role of the central mentality of the Contra Complex; you have been lifted into a state of limited



cryogenic suspension, half-awakened into a world in perpetual collapse. Your immediate objective is to keep the underground complex running smoothly; your overall objective is to reset the all-important filtering computers.

To help you overcome the rapid-fire problems that come your way, you have been given six robots to command. You have also been given a game board with pieces that will help you keep track of the complex and your robots.

The robots all have different functions, specialties, and quirks. Auda monitors all auditory stimuli. Sensa reports on the seismic and vibrationary patterns of flux in the city. Iris' function is to keep tabs on the various control and weather monitors. Whiz, the brains of the outfit, is able to plug into the various advisory pedestals. The Heinleinian Waldo is the workhorse; with his multiple extensions he can do most anything. Then there is Poet. As his name suggests, Poet is slightly more playful, though no less rational, than his peers. With comments like "I'm Zen on Inventory" and "As much as anyone can be anyplace, I'm here," Poet relieves tension and frustration, a walking martini.

The other robots are not complete stiffs either. Waldo, when asked to perform a task he considers difficult, will reply, "You have just entered the zone whose boundaries are those of the wishful thinker." Meanwhile, Iris might be plaintively sending, "It would be real nice if I got repaired."

Speaking of Iris, a hint or two: at the beginning of the game, Iris is isolated from the others (because a crucial corridor is blocked) and is blind. The first order of business is to repair Iris. With Iris functioning, the game is, well, *playable.* To get to her, to pass the impassable, a wedge is required. I will say no more.

The player has a vocabulary of six hundred words with which to communicate with his or her robots; the text itself, of course, contains a much wider vocabulary. We'll close with Poet's reply when asked to describe Iris: "Iris is the personification of petite beauty. As the old timers say,

The young lady always wore mink
While her visual circuits went
'blink'
The young man's delight
Night after night
Was her blushing a bright shade of
pink.

—Robert J. Sodaro

HOMETAX

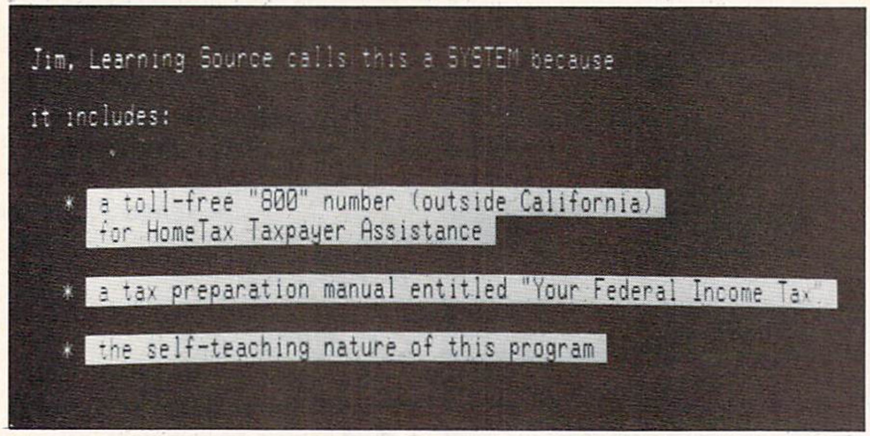
Learning Source Inc.
C-64 (CP/M Capable)

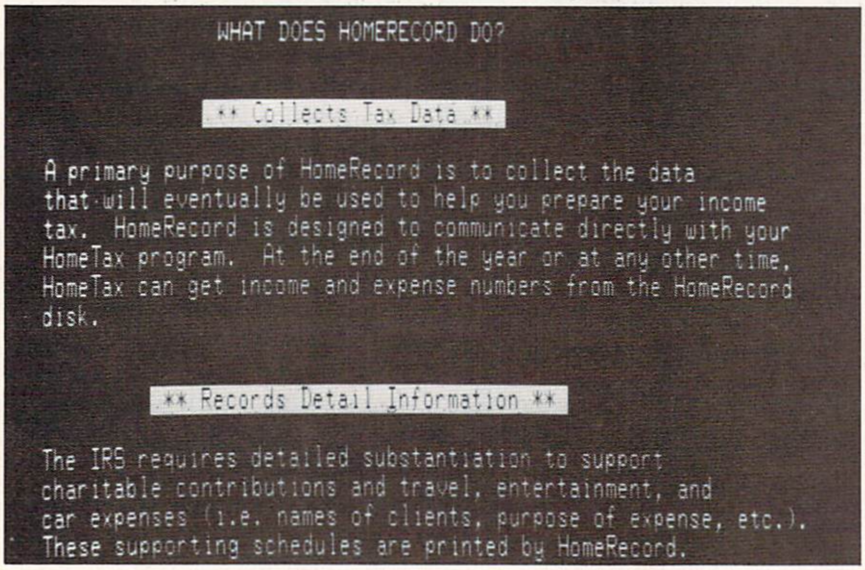
Learning Source, Inc. is a California firm that has begun to launch an operation that they hope will completely revolutionize the retail computer field. It is their intention to set up nationwide franchises which will in effect make them, as they put it, "to the computer field what MacDonalds is to burgers."

What they have in mind is not the ordinary franchise operation. Their plan goes something like this. The retail computer business, according to president George Hoss, is filled with people who do not necessarily know anything about computers. How many times have you gone into a computer store and asked a salesperson a question that (s)he was not able to answer? It is Learning Source's concept to thoroughly train its franchises before turning them loose in the retail computer world.

Another aspect of their operation is something that should be of tremendous interest to anyone who has a personal computer which is CP/M compatible. They have created a new income tax program which was given a thorough checkup and imprimatur, as it were, by Price Waterhouse; it was also given a benign nod by the IRS.

An extremely powerful program created by accountants and geared to the 1040 form, *Hometax* has been written in such a way as to make it quite simple for anyone to





do their own income tax without making the sort of mistakes that can prompt an all nighter or an audit. For example, it is very easy for a taxpayer to inadvertantly take deductions which are not legal, and which can result in unnecessary penalties. *Hometax* employs a simple question and answer format; the taxpayer is taken through the 1040 step by step. Nothing is left out. By the time you have completed the job, supplying all the necessary figures, you have in essence done your own income tax. The program does the rest for you.

In addition, *Hometax* lets you calculate any interest you may have paid on a loan in any given period of time. Let's assume that you took out a loan in 1980 for $1,000.00. You have been paying regularly ever since. You took the loan out in the month of May that year, and it is now November, 1983. What you want to find out is how much interest you have paid from January to the present, also how much interest you have paid cumulatively since you began paying off the loan and so on. The *Hometax* program does it all for you.

In addition to the program, Learning Source gives you an 800 number to call in case you have questions which you would prefer to be answered by a human being. They also supply owners of the program with periodic updates of tax information, and any program updates which may be developed, the latter for a price far lower than the cost of a new program.

The Hometax sells for a mere $95.00, which is considerably cheaper than it would be to have this kind of comprehensive work done on a tax return that may be reasonably complicated. The program, by the way, is similar to a $2,000 program available only to professional accounting firms. For owners of the Commodore computer, it is necessary to get a CP/M card, but it's worth every penny in the elimination of grief that will result from having this program.

Hometax may be ordered directly from Learning Source, Inc. at 17791 Fitch Street, Irvine, California 92714.

—Bernhardt J. Hurwood

CANNONBALL BLITZ
Sierra On-Line
VIC-20 Cartridge

I'd seen this game in other formats, and was looking forward to this new VIC-20 release for the chance to review it.

Cannonball Blitz, make no mistake about it, is *Donkey Kong* in dress blues. Not a bloody thing new here. However: you're going to find it a barrel of fun.

There are three different games: 1) ascend the sloping levels, jumping cannonballs (or hammering them for points) and capturing the flag on top; 2) climbing ladders, riding elevators, etc., to reach the flag, all the while avoiding cannons and such which pursue you; and 3) crossing over and thus removing the "plugs" from floors on each level, ducking cannonballs which are constantly being fired as you do your duty.

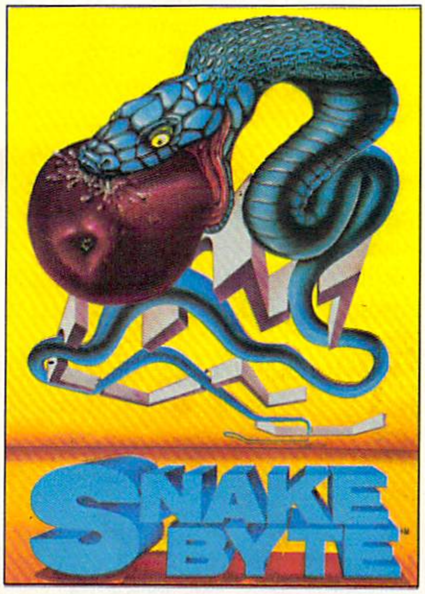
Like I said, *Donkey Kong,* levels one, two, and three respectively.

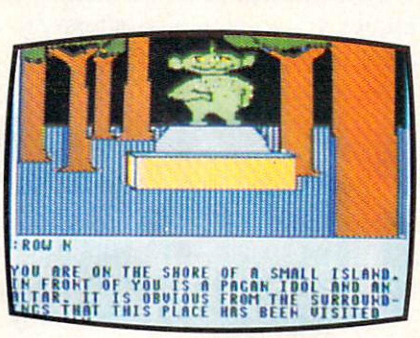
But the animation is lovely to behold—if drab; only the flag and its soldier guard are brightly colored—and the sound effects are *unbelievable.* It's almost worth being blown up to hear the "roar of thunder" generated by the cartridge.

What's especially appealing about *Cannonball Blitz* is that you can play any level you want *when* you want. You don't have to suffer through a screen which you find boring or unconquerable.

The Vic-20 cartridge is a very good version of a fine game.

—E.C. Meade





SNAKE BYTE
Sirius for the 64 and VIC
Disk; Cartridge; Keyboard
Graphics: B–
Gameplay: A-

S*nake Byte* is as simple as a game can be; you've got to maneuver a Snake around a virtually blank screen, eating the Apples which appear. There are three pitfalls, however. One: you must avoid the bouncing Plums which, if they conk you on the noggin, end your slithering posthaste. Two: you mustn't allow the Snake to come into contact with any part of its body. Three: you can't allow the Snake to touch any of the four sides of the screen, any of which is lethal.

One more thing: the Snake grows in length each time it gulps down an Apple. In short order, you're going to have a serpent the size of a garden hose.

Obviously, the Snake can only be moved with right-angle turns. (Up/down, if it were permitted, would cause the animal to double back on itself and selfdestruct.)

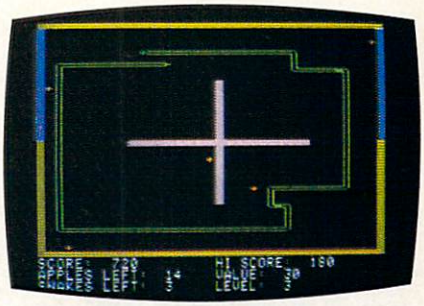
Snake Byte also has labyrinth screens, which turn the game into a video version of those maddening, handheld liquid mercury mazes. For cowards, there's also a Plumless game.

Without a doubt, *Snake Byte* is one of the most engaging and challenging programs you can buy. The game has its own safeguard against boredom and obsolescence, due to the Snake's capacity to increase its size and speed.

Visually speaking, this may not be the most imposing game you are ever likely to play. But you can't hope to do better in terms of entertainment.

—E.C. Meade

THE BLADE OF BLACKPOOLE
Sirius for the 64
Disk; Keyboard
Graphics: D-
Gameplay: B



Unlike videogames, which rocketed to a peak and then took a nosedive, adventure-gaming has been a steadily building staple. The essence of the genre is for players to essay the role of a hero (or antagonist) and hack/shoot/vaporize his or her way through a lengthy quest using "toy" figurines, a detailed gamemap, and a thick book of rules.

Computer adventure-games put all those elements on the monitor, and *then* some. As a result they're infinitely more involving than standard videogames. There is no rock-em, sock-em action; play is thoughtful and deliberate.

A vista is painted from the hero's point of view, the scene is described in a text caption, and the player is asked to make a decision, such as examine an object like a rock or knothole more closely; talk to a peasant; bargain with a god; and, when the dealings are done, move to some new compass-point. The commands are usually issued in one or two words, such as BUY KNIFE or LOOK PAPER.

Death is an everpresent danger, but, if (s)he can manage to avoid it through trial and error, it is altogether possible for a player to keep a game going literally for months.

The Blade of Blackpoole is a fine specimen of this type, a far-reaching medieval era game. Though the color graphics are sketchy, the game has an excellent

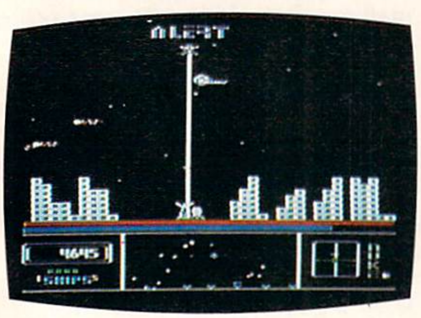
vocabulary and enough tribulations—quicksand, a carnivorous plant, a leaky boat, the Valley of Gloom, and an avalanche, to name but a few—to swallow up hours of your time in a swift gulp.

The only drawback is the game's lack of originality. We've seen so many forests, lakes, and taverns in sword-and-sorcery games that I long for something set in a 50s diner, bus terminal or locker room.

How about it, Sirius?

—E.C Meade





REPTON
Sirius for the 64 and VIC
Disk; Cartridge; Keyboard or Joystick
Graphics: B
Gameplay: C+

Rivaling *Pac-Man* for the crown of "Most Overused Theme" is the motif pioneered by the arcade game *Defender.*

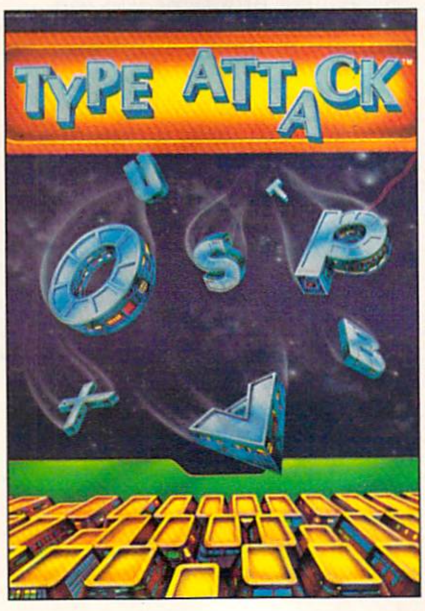
The player commands a futuristic ship which can move both vertically and horizontally. As a city scrolls below, the ship must shoot down a variety of enemy craft, some of which just bob about, others of which sport weapons of their own. A radar scanner alerts the player to enemies lurking on either side of the screen.

Repton is a good example: all the standard elements are present, from the overground city to the underground enemy base where stalactites and stalagmites inhibit the player's maneuverability.

The problem is that there's nothing new here. You'd be well advised to buy it only if you're in the market for a definitive *Defender*-like shoot-em-up.

It's just a coincidence, in all probability; still, one can't help noting that the name *Repton* contains half the letters found in *Repetition...*

—E.C. Meade





TYPE ATTACK
Sirius for the 64 and VIC
Disk; Cartridge; Keyboard
Graphics: B
Gameplay: A

A sensational learning game for aspiring typists young and old! Borrowing the basic *Space Invaders* format, this game has a jumble of letters descending upon your ground-based position. You must pick off each F,D,A,S, number, punctuation mark, etc. by poking the appropriate key, which unleashes a laserblast. You have only a limited amount of firepower, and hitting wrong keys will cost you dearly.

At the end of a Character Attack Wave, the player must endure a Word Attack. Complete words sail across the screen; the only way to score is by typing out and thus obliterating those words.

Type Attack also boasts a Lesson Creator screen which allows you to plug any letters you wish in a Character Attack wave. This is the ideal way to learn those letters which are giving you trouble.

The Lesson Creator can also be used for a Word Attack. The word you choose can be up to eight characters in length.

This game may not be as flashy as the pure adventure programs, but it's vastly more constructive. What could be of more value to a computergamer than good typing skills?

—E.C. Meade



This Christmas, Atari and Commodore* owners will go out of their minds.

It'll take about 30 seconds.

Because once you boot a Datamost game on your Atari home computer, or your Commodore 64, you'll come face to screen with the most mind-blasting games ever.

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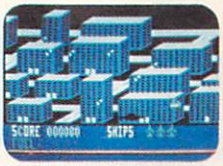
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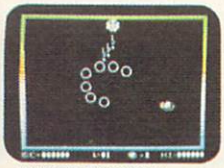
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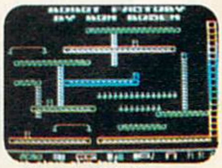
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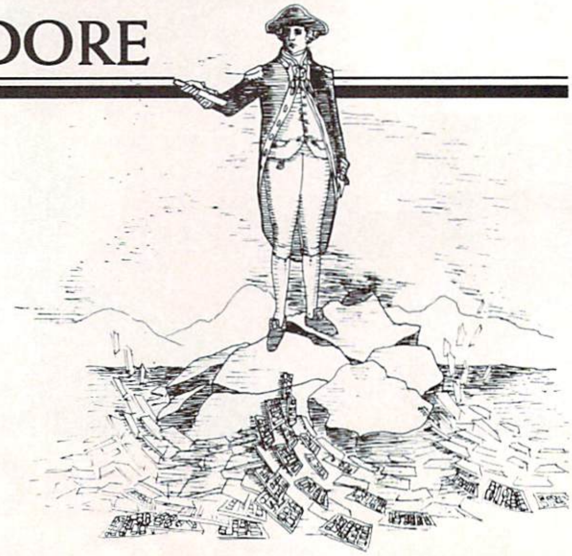


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Reader Service No. 26



JOHN VON NEUMANN: The Genius Behind Computers

© *By David Ritchie*

CRASH! An automobile collided with a tree. Fortunately, the driver—a portly scientist with thinning hair—survived, and later described his accident in terms of relativity theory.

"The trees on my left were passing in orderly fashion at fifty miles per hour," he said. "Suddenly one of them stepped out in my path!"

The unlucky motorist was John von Neumann, of Princeton. A Hungarian who fled Hitler's Europe and resettled in the United States, von Neumann was one of the most influential scientists of our century, and perhaps the most gifted mathematician of all time.

Von Neumann did much to make the modern electronic computer possible. Your home computer operates on principles laid down by von Neumann almost forty years ago. And the world around you would probably have been a much different place if John von Neumann had never lived.

Von Neumann was born into a well-to-do Budapest family in 1903. He displayed his gift for mathematics at an early age. Once he noticed his mother staring out pensively into space, lost in thought, and asked her: "What are you calculating?"

His school career was predictably brilliant, and he did graduate work at Gottingen, the German Mecca of mathematical research. When Hitler started making Germany an unhealthful place for Jewish scientists, however, von Neumann left Germany and joined the mass exodus of European brainpower to the United States.

He joined the faculty of Princeton University, and delighted the university community with his personal charm (he was a master storyteller and had a huge repertory of jokes), while dazzling his fellow scientists with his mental might and versatility. He was famed for his ability to work fantastically long and complex math problems in his head, and took only a few moments to arrive at answers which took other mathematicians hours of work with a calculator.

Von Neumann's intellect was so prodigious that he was rumored to be a Martian living incognito on earth. One of his co-workers even suggested that von Neumann belonged to a species "superior to man."

His genius, however, did not extend to driving. He wrecked cars on a regular basis, and drove with aplomb on either side of the road.

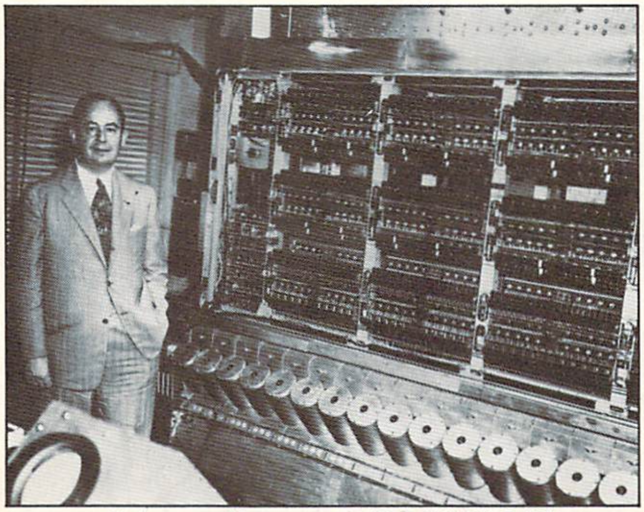
When not demolishing automobiles, von Neumann was expanding the boundaries of higher math and its related sciences. His invention of game theory, a mathematical description of how games—from poker to the Cold War—are played, gave the world a powerful new tool for scientific and social analysis. He also came up with mathematical models that aided greatly in the making of the first atom bomb.

But von Neumann thought that even the A-bomb was insignificant compared to another device he helped develop: the electronic computer.

One day shortly after the war, a friend and colleague of his, who had spent the war years in South Africa, came up to von Neumann and said, "I hear you are now thinking about nothing but bombs."

"That is quite wrong," said von Neumann. "I am thinking about something much more important than bombs. I am thinking about computers."

Von Neumann's career in computer science began in 1944. He was waiting in a train station and happened to meet there a mathematician from Philadelphia named Herman Goldstine, who revealed that he was working on a new kind of computing machine that could carry out more than three hundred calculations per second.



John von Neumann with MANIAC (?).

All at once "the whole atmosphere of the conversation changed," Goldstine recalled afterward, "from one of relaxed good humor to one more like the oral examination for the doctor's degree in mathematics."

Von Neumann was fascinated. Here was the device that mathematicians and physicists had been longing for. It could handle large numbers of long and complicated calculations, and do them more quickly and reliably than even the most talented human.

The machine was ENIAC, short for Electronic Numerical Integrator and Computer. Von Neumann was eager to see it, and ENIAC's creators at the University of Pennsylvania gave him the grand tour.

ENIAC was a room-sized monster that contained some 18,000 vacuum tubes. (The transistor was still a few years in the future, and the silicon microchip had barely even been dreamed of.) Inspired by ENIAC, von Neumann immersed himself in computer science.

Very soon he was thinking beyond ENIAC, toward a much more advanced computer called EDVAC, for Electronic Discrete Variable Computer. And almost as soon as EDVAC took shape in his mind, von Neumann was looking ahead to even more powerful computers.

Soon he was ready to report on his work. In 1945 he produced a paper entitled "First Draft of a Report on the EDVAC." The dry, simple title belied the paper's importance, for it was nothing less than a systematic blueprint for building computers.

Von Neumann did not concern himself overmuch with the hardware aspect of computers. He knew that computer hardware would undoubtedly change greatly in years to come. Instead he outlined the logical structure of information processing by computer from input to output and everything inbetween.

Von Neumann's study was to computers roughly what *Gray's Anatomy* is to the human body. Today every computer that runs is based on von Neumann's ideas.

As more and more advanced computers became available, naming them became a kind of game. One was called the JOHNIAC in von Neumann's honor. Von Neumann himself had an opportunity to name another computer. He christened it the Mathematical Analyzer, Numerical Integrator and Calculator—MANIAC.

Had von Neumann lived a few years longer, he would have witnessed breathtaking advances in computer technology. One day in 1955, however, he fell and injured his shoulder. When he had the injury treated, he was diagnosed as having bone cancer. He knew he had only a few months to live.

Von Neumann died on February 8, 1957, at Walter Reed Hospital in Washington, D.C. Ironically, his own work may have killed him. He had many friends and colleagues in the military-industrial complex, and after helping develop the first nuclear bomb, von Neumann became a bomb aficionado, attending atomic tests in the Southwest and watching the huge yellow fireballs rise up over the desert. Perhaps some of the fallout from those tests worked its way into his body and caused his fatal cancer.

Von Neumann died as he had lived: quietly, and out of the public eye. There are no statues to him. He needs none. Our modern computerized world is his monument.

In a few short years, electronic computers have come to influence almost every aspect of our lives. We rely on computers for so much that our society might collapse if we tried to go back to the precomputer era.

This is what von Neumann meant when he said that computers would turn out to be more important than bombs. Nuclear weapons, for all their power, have done little to alter our daily lives. The Bomb has made us a little more nervous, but that's about all.

Computers, on the other hand, have transformed life for us in countless ways. They have improved communications, accelerated our thought processes, and provided faster and more efficient methods for doing just about everything.

Computerized weather predictions have saved thousands of lives. Computer-assisted doctors and

Continued on page 66

By Michael Kleinert & David Barron

A Peek At Memory On The Commodore 64

The Commodore 64's memory is composed of 65,536 individual units of memory called bytes. Collective units of memory, usually referred to as memory locations, are dedicated to different functions. A working knowledge of these locations will be to the programmer's advantage.

Here is a general diagram of the memory in the Commodore 64. It is called a memory map.

0	
	Zero Page
256	
	The Stack
512	
	Input Buffer
601	
	System Memory
828	
	Cassette Buffer
1024	
	Screen Memory
2048	
.	Basic Program Storage Area
32768	
	Cartridge Memory
40960	
	Basic Language
49152	
	Free Memory
53248	
	Video Chip Memory
54272	
	Sound Chip Memory
55296	
	Screen Color Memory
56320	
	Input/Output Memory
57344	
	System Subroutines
65535	

Here is a closer look at the composition of each memory location:

Zero Page

This memory is used by the computer as a form of scratchpad space. Here it stores temporary as well as permanent data which the computer uses to keep track of what it is doing. In addition there are certain machine language commands which the computer has to execute that can only work with zero page memory.

The Stack

The stack resembles a stack of cards: the last one placed is the first one withdrawn. Here is an example:

Suppose we put these five numbers into the stack:

1
7
5
8
76

When we read the numbers out we would get:

76
8
5
7
1

The stack is used by the computer for temporary storage of numbers. For example, when you use a GOSUB statement, the computer "pushes" the line number where the gosub was so that when the computer finds a RETURN statement it knows where to return to. Other functions include nested FOR. . .NEXT statements and mathematical expressions that involve parentheses.

Input Buffer

When you type in a line of your program, the computer puts it here before it stores it with the rest of your program. This is because it must convert all the words like PRINT and LET into codes that the computer uses when it runs your program. In addition, it converts line numbers into their binary equivalents.

System Memory

This area of memory is used to store larger temporary data. It holds information such as filenumbers and current character colors, to name a few. It holds the keyboard buffer as well. The keyboard buffer stores what you type until the computer is ready to retrieve it. This area also contains a directory of where different commands reside in the computer's memory.

Cassette Buffer

When the computer transfers data to and from the cassette, whether it be a program or a file, this section of memory holds the data before it is either put on the cassette or put into the computer's main memory. This memory is not used for data transfer using the disk drive.

Screen Memory

All characters that are on the screen have memory locations allocated to them. Each character occupies one byte of memory in the range 1024 to 2023. The first character in the upper left hand portion of the screen occupies memory location 1024, the next character on the screen occupies memory location 1025, and so on. This continues all the way across the first line of the screen. When the end of the line is reached the memory locations continue sequentially starting with the first character of the second line.

All characters have a certain code assigned to them. These codes are listed in the appendix of the manual that accompanies the Commodore 64. Even if there is nothing on the screen at a certain spot, there is a 32 stored there. 32 is the code for a space.

Basic Program Storage Area

This area of memory holds your BASIC programs. They are stored here in tokenized form. This means that all keywords such as LET, PRINT, etc. are stored as single numeric codes called tokens. This area of memory may also be used to hold machine language programs as well.

In addition to your BASIC program, all variables are stored beyond your basic program. This is why you find that you have less memory available after you RUN a program.

Cartridge Memory

If there is a cartridge plugged into the computer, it usually has its memory located here. If there is no cartridge in the computer this area becomes free for use by your programs.

Basic Language

This is where the computer holds the instructions to understand BASIC. This area of memory cannot be changed by the user. It is permanent memory; this is why you can program immediately after turning the computer on.

Free Memory

This memory is free for any purpose. It cannot be used for BASIC, but if you program in machine lan-

guage it can be quite useful.

Video Chip Memory

Inside the Commodore 64 there is a device called a VIC CHIP. This stands for Video Interface Controller. As its name implies, it controls all that you see on your screen. It has certain memory locations dedicated to storing information about the screen. This includes sprites, colors, and smooth scrolling.

Sound Chip Memory

Just as there is a chip to control the video, there is a chip to control the audio. This is called the SID chip. SID stands for Sound Interface Device. It is responsible for making any sounds produced by the Commmodore 64. The sound chip found in the C-64 is one of the most advanced on the market. Specific locations in this range of memory control audio characteristics such as volume, frequency, attack, decay, filtering, and many more.

Screen Color Memory

The screen memory mentioned earlier controls which characters will appear on the screen. This section of memory controls the color of each character displayed on the screen. This information is stored in the same format as the character memory. The only difference is the starting location. In this case it is 55296. The codes for the 16 available colors may also be found in the manual for the 64.

Input/Output Memory

Whenever the computer has to communicate with devices such as the printer, disk drive, joystick, and keyboard, the computer looks here. Each type of device has a certain locations(s) that it uses to communicate with the C-64. If you had to check the position of the joystick or paddle you would look here. There has even been space left free for future devices.

System Subroutines

In this area of memory the machine language routines containing general, useful subroutines are stored. They are used by BASIC as well as user written machine language programs. They include output to device as well as input. These also control error and control messages and the like.

This, we trust, will have provided some insight into the versatility of the Commodore 64's memory. In the next issue we will show you how to use the PEEK and POKE commands to modify and observe memory.

commodore 64

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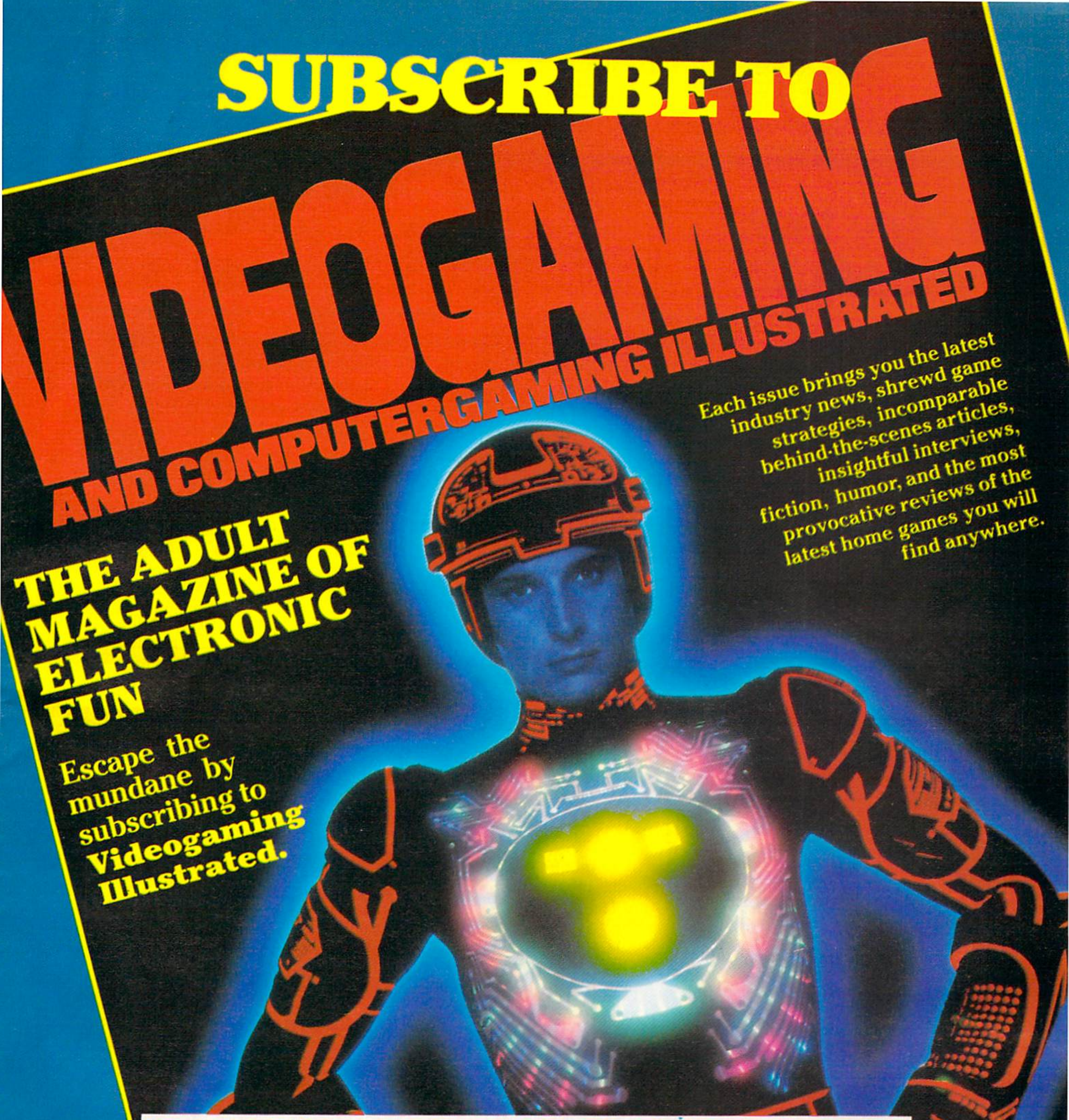
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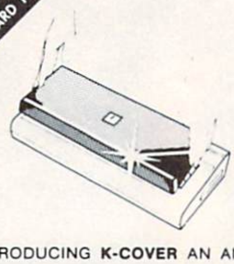
medical researchers have saved thousands (if not millions) more, with improved diagnosis of diseases. And home computers have inaugurated a worldwide ''information revolution'' which may prove to be the greatest event in history since the discovery of fire.

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David Ritchie, 30, is a science writer living in Vermont. This article is adapted from his book The Binary Brain, *a study of computers and artificial intelligence, to be published next year by Little, Brown. His articles on scientific topics have appeared in numerous magazines, including* Analog, Inquiry, Omni, Technology Illustrated, *and* The Writer.

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Reader Service No. 29

By Michael Kleinert and David Barron

PROGRAMMING Sequential Files ON YOUR DISK DRIVE

There are five types of files that can be accessed by the 1541 disk drive. These are: 1) Sequential, 2) User, 3) Relative, 4) Random, 5) Program.

Of these five the sequential, user, and program files operate in the same manner, but are used for different purposes.

Sequential and user files are both usef for storing information that will be used for a program. Program files can be used the same way; however, they are generally reserved for storing programs.

These three types all operate in a sequential manner. This means that each element in the file comes right after the other. In other words, if you wanted to retrieve the ninth data element you would have to go through the first eight prior to reaching the ninth. In addition, there is no way of apending to the file without rewriting the entire file.

Now let's take a look at how sequential file types are used in your programs.

To create a file, you must use the OPEN command. This command takes the following format:

OPEN (file #), (device #), (Channel #), "(drive #) : (filename), (filetype), (read or write)"

Let's examine this command in detail:

OPEN—This instructs the computer to create a file with the following information.

(file #)—This can be any filenumber that is not currently open. The filenumber may range from 1 to 127.

(device #)—The device number of the disk drive is 8.

(channel #)—This can range from 2 to 14 for data files. For other purposes numbers 0,1 and 15 have been reserved.

(drive #)—This is the number of the disk drive. The first drive is zero, the second drive is numbered 1, and so on.

(filename)—This can be any name up to 16 characters long. This is what the file will be called in the diretory.

(filetype)—Single letters are used to indicate filetype as follows: S=Read

P=Program

U=User

We recommend that you use the S filetype. (read or write)—Once again this is designated by a single character. R=READ

W=WRITE

Read specifies that we are taking data from a file. Write specifies that data is being written to a file.

Let's say we wanted to open a sequential file for writing on drive zero with file number 2. Here is a sample program line to do this:

```
10 OPEN 2,8,2,"0:SAMPLE,S,W"
```

Variables can also be used to hold information used when opening the file. Here is an example of this:

```
10 LET F=2           :REM FILE
   NUMBER
20 LET D=8           :REM DEVICE #
30 LET C=2           :REM CHANNEL #
40 LET N$="0"        :REM DRIVE #
50 LET P$="SAMPLE"   :REM FILE NAME
60 LET T$="S"        :REM FILETYPE
70 LET RW$="W"       :REM WRITE TO
   FILE
80 OPEN F,D,C,N$+":"+P$+","+T$+
   ","+RW$
```

Once a file is open for writing, the PRINT # command is used for sending information to the disk. It follows this format:

PRINT #(filenumber),(data)

The filenumber must be the same as the one in the OPEN statement. The data may be either numberic or string data.

Since data is stored on the disk sequentially, data separators must be placed in between the individual

data elements. This is done automatically if the following restrictions are avoided. If you place a semicolon at the end of the data you are printing (PRINT #), the next data element will be "glued" to the previous one.

There are other ways of separating data elements. Commas, colons or CHR$(13)'s (carriage returns). If any of these are contained in a string to be printed to a file they will split the string into different elements wherever they occur. For example, if the command PRINT #2, DAVID, DID YOU SPEAK TO TIM?" was issued, two separate data elements would be put into the file: "DAVID" and "DID YOU SPEAK TO TIM?"

If a file has been created, a way of retrieving the information must be devised. This can be done two ways, either with GET # or INPUT #.

The INPUT # and GET # follow the following format:

INPUT # (filenumber)
GET # (filenumber)

INPUT# reads an entire data element out of the file at once. The filenumber must be the same as the one used in the OPEN statement. An example of this is: would be:

```
30 INPUT#2,A$
```

GET # works similarly except that it reads a single character from the file. This includes data separators. Here is an example:

```
30 GET#,A$
```

Here is a sample program to show you how it reads file separators:

```
10 OPEN2,8,2,"0:TEST,S,W"
20 PRINT#2,"HI, HERE: ARE, SOME:
   DATA SEPARATORS."
30 CLOSE2   : REM SEE NEXT
   PARAGRAPH
40 OPEN 2,8,2,"0:TEST,S,R"
50 GET#2,A$
60 PRINT A$;
70 IF A$<>"." THEN 50
80 CLOSE2
90 PRINT "NOW WITH INPUT#":PRINT
100 OPEN 2,8,2,"0:TEST,S,R"
110 INPUT#2,A$,B$,C$,D$
120 PRINT A$
130 PRINT B$
140 PRINT C$
150 PRINT D$
160 CLOSE2
999 END
```

If you RUN the above program you will see that GET # picks up the data separators and INPUT # does not.

The CLOSE(file number) command is used to "close" a file when you are done using it. Filenumber specifies which file to close since there may be more than one open at a time. If a file is to be reopened, it must be closed first.

The following phone book program demonstrates the techniques we have talked about.

SEE PROGRAM LISTINGS ON PAGE 89



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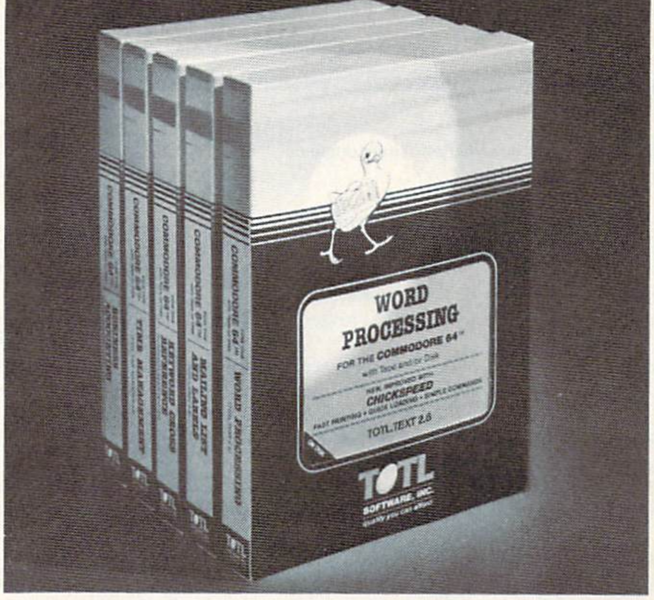
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Access. Retrieval of information from computer memory.

Access time. Time needed to retrieve information from computer memory.

Address. Location (identified by a number) of a byte of information in the computer's memory.

Alphanumeric. Alphabetic and numeric characters.

Analog signal. A continuous electronic signal of any frequency or strength that represents a condition (i.e.: the position of the game control paddles).

Applications software. Programs that will instruct the computer to perform either a specific task or a series of related tasks, usually relating to business or home uses.

ASCII. The American Standard Code for Information Interchange. This code allows two computers, which may entertain different languages, to communicate.

Assembler. A program that converts information in the computer's memory into a binary code for proper execution.

Assembly language. Machine language that has been translated into mnemonic codes, thus making it easier for the programmers to remember. A three letter code would be the equivalent to a string of eight digits.

BASIC. Beginner's All-purpose Symbolic Instruction Code. Easy to use, popular programming language that is widely used with microcomputers.

Baud. A unit (bits per second) that measures the rate of speed at which data is translated from one device to another. (Heck, every baud *we've* ever known has been fast.)

Binary code. A system of numbers that uses two digits, 0 and 1, to express all characters (both numbers and letters). The computer then uses this string of numbers to process information.

Bit. An acronym for *B*inary Dig*IT*. Represents either "0" or "1" in the binary code. Approximately eight bits (one byte) are required to represent one character.

Bidirectional printing. Special feature on some computer printers that allows the printer to print first right to left and then drop to the next line and print left to right. This feature speeds up the printing process.

Board. A thin, rectangular, flat electronic component that contains one or more layers of printed circuits. Chips and other electronic parts are often attached to a circuit board.

Boot. To start or restart a computer by transferring instructions ("Heel!"?) from a storage device, such as a tape or disk, into the computer's memory.

Bug. A logic error in a computer program that causes the program to dysfunction.

Bus. A conductor that allows data to be passed between the various computer components. Buses are manufactured that will allow different brands of components to be used with the same computer. (They can often be seen entering terminals.)

Byte. Plural of bit. There are eight bits in one byte. Each byte represents one character.

CAI. Computer Assisted Instruction. This refers to a variety of instructional and/or educational software.

Card. A circuit board which is attached to a standing computer, often to boost its memory capability.

Cartridge. Sometimes referred to as a ROM module or solid state cartridge. Device that contains a prerecorded program (such as a game).

Cassette Tape Recorder. Device used either to store data or to house prerecorded programs. Often, but not always, the same type used in audio recording. If so, a special interface may still be required. A much slower and less reliable medium than disk drive.

C-BASIC. Very popular non-interactive language that is utilized by 8080, 8085 and Z80 microprocessor computers. C-BASIC executes data at a more accelerated rate than the standard interpreter BASIC.

Character. A single symbol, letter, or number.

Character set. Total catalogue of alphanumeric, special, and punctuation characters accessible to a printer or terminal.

Chip. An integrated circuit, a quarter to three quarters of an inch square, that is etched on a tiny piece of silicon. Chips are the building blocks of computers and are able to contain anywhere from a few dozen to several thousand transistors or circuit elements. They perform many functions: calculations, memory operation and storage or controlling other chips. Up to 32,000 bytes of information may be stored in a single chip.

CPU. Central Processing Unit, or microprocessor. The electronic "core" of a computer. All information is passed through the CPU and all functions are executed from the CPU.

Circuit Board. see board.

COBOL. Acronym for Common Business Oriented Language. High level language for business applications.

Command. An instruction (e.g.: run, load) that tells the computer to do something.

Compatibility. The ability of the computer and any or all of its peripherals to be able to function in conjunction with one another.

Compiler. A program that translates any high level language into the binary code that is required for the computer.

Computer. A programmable electronic device, consisting of a CPU, memory and input/output (I/O) capability, that stores, retrieves, and processes data.

Computer system. A computer setup that consists of a computer terminal and its software and various peripherals.

CP/M. Control program for microcomputers. A single-user operating system for microcomputers that is in very wide use, especially for business applications.

CRT. Cathode Ray Tube. The most popular type of display screen. Often it is simply the screen of an ordinary television set though it can be a monitor specially designed for use with computers.

Cursor. Symbol, most often a small flashing square, that indicates where the next character will appear.

Data. All information that is processed by the computer.

Datum. Singular of data.

Data Bank. The central storage locations for all of the information that the computer has access to.

Data base manager. Program that enables user to enter files, organize matter and sort and retrieve information.

Daisy wheel printer. A letter quality impact printer that utilizes a daisy wheel, a circular printing element containing as many as a hundred characters.

Descenders. The lower case characters g,j,p,q, and y, which have tails that extend past the baseline formed by the other characters.

Disk. A flat, round device for storing computer data. Like a phonograph disc, it rotates and contains information in tracks. Unlike a phonograph disc, it is never removed from its protective jacket. A disk can be made of hard plastic (hard disk) or soft plastic (floppy disk, diskette).

Diskette. See disk.

Disk drive. A machine that rotates a disk for the purpose of entering new information or copying existent information from the disk into the com-

puter's memory.

Display. Generally a television-style screen, it shows the user the information contained in the terminal memory.

Documentation. Written instructions for operating hardware or software.

DOS. Disk Operating System. (See Operating System.)

Dot matrix. The method by which most printers form alphanumeric characters or graphics, by printing a series of dots.

Double-density. Refers to the process of doubling the amount of information that can be placed on a disk or cassette.

Downtime. When a computer is "down," or unoperational.

Dual Intensity. Refers to a printer that can produce bold type in additional to ordinary type.

Editor. A program which makes it possible to enter text into a computer.

Electronic mail. Telephone transmission (via a modem) of information between computer users.

EPROM. Erasable Programmable Read Only Memory. A device such as a cartridge or disk that can have data added to it or erased.

Floppy disk. See disk.

FORTRAN. Formula Translator. Advanced programming language used for complex mathematical operations.

Emulator. A program-translating device that enables software designed for a particular computer to run on a different one.

Firmware. ROM-contained data, built into the machine or added via software, that cannot be changed.

Flow chart. Diagram outlining procedure for writing a program.

Format. (or Initialize) To get a disk ready to accept information.

Function key. A key on a computer that can be assigned to perform a particular function.

Full duplex. Communication mode capable of simultaneous transmission and reception of data.

Graphics. Non-textual CRT displays: charts, symbols, etc.

Graphics tablet. A device which will transfer whatever is drawn on it onto the computer monitor.

Half duplex. Communication mode capable of transmission of data and reception of data, but not at the same time.

Hard copy. Information, when it has been transferred from memory to a computer printout, is hard copy.

Hardware. Mechanical, non-software components of a computer system: computer, disk drive, printer, etc.; also, the components of the components, such as transistors, circuits, etc. Also the components of the components of the . . .just kidding.

Hard disk. Nonremovable storage device that is faster and has a far greater storage capacity than a floppy disk. It is generally hermetically sealed within the unit.

Hexadecimal. A base-16 numeration method widely used with computers. Numbers run from 0 to 9, then from A to F. Hexadecimal (or "hex") numbers are identified with the suffix H.

High-level language. An easily learned programming language that resembles human languages such as English. Examples. BASIC. COBOL, FORTRAN. Low level languages (such as Assembly) require that every command and function be separately programmed.

High resolution. High-quality graphics capability when applied to a video terminal. An individual software program may itself contain high-resolution graphics, meaning detailed or colorful graphics. A subjective term and therefore frequently abused (especially on New Years Eve).

Impact printer. A typewriter-style printer that presses characters through a ribbon.

Index hole. A hole punched in a floppy disk that is used by the disk drive to locate the beginning of sector 0 on the disk.

Instruction. A command contained in a program.

Interface. A connecting device which can be electronic or can be contained in software, for making a computer compatible with a peripheral device.

I/O. Input/Output. The system of pathways which channel information into a computer (usually through a keyboard, joystick, mouse, light pen) and out of the computer (usually onto a screen or printer).

K. See "Kilobyte"

Kilobyte. See "K". Seriously, a kilobyte (or 1K) is equal to 1,024 bytes (often rounded off to 1,000 bytes), and is the measure of the memory hardware or software can contain (8K, 64K, etc., etc.). Obviously, the higher the number the more capable the hardware/software.

Letter-quality. Refers to a printer that uses formed characters, such as those contained on a daisy wheel. Compare dot matrix printer.

Library. Collection of computer programs.

Light Pen. A device that allows a user to draw line figures or make menu selections directly on the screen. Proper hardware port and software required.

Load. Entry of information into the computer from an external storage, such as cassette player or disk drive.

LOGO. Programming language useful for graphics. Primarily employed in young children's education, each command is built logically on the previous command.

Loop. Programming statement used to order repetition of a task. A particularly useful one is called a "fruitful loop."

Machine language. Language used by the computer, comprised of binary numbers, into which the computer must translate programming languages.

Megabyte. Equal to 1,048,576 bytes (1048 kilobytes). Often abbreviated Mb.

Megahertz. Electrical frequency measure equalling one million cycles per second. Often abbreviated MHz.

Membrane. A flat computer keyboard that has touch-sensitive areas for each character rather than full-travel or stepped keys.

Memory. The word used to indicate any given computer's capacity to store information (10K memory etc.). There are different kinds of memory (ROM, RAM) and, within any computer, different memory locations (for sound, screen displays etc.).

Menu. A screen display of programs, on a particular disk or options in a program.

Microcomputer. An integrated small computer. It contains a microprocessor, memory, and interfaces for inputting and outputting information. Perfect example? Commodore 64.

Microprocessor. The brains of the computer, where mathematics and logical functions are performed. Also called the CPU.

Modem. Modulator/Demodulator. A device that changes information in analog form into digital form, and vice versa, for the purpose of transmitting computer information across a telephone line.

Monitor. Screen for displaying computer information.

Mouse. An input device, usually containing a selection button. The user slides the mouse on the

desktop beside the computer, and the cursor will duplicate the mouse's movement on the screen. Used to make menu selections and re-arrange information.

MP/M. Multiprogramming control Program for Microprocessors. A variety of the CP/M operating system that can be used by several users at a time.

Multi-user system. A system with a central pool of data or applications that can be accessed simultaneously be several users.

Number crunching. Refers to a computer's carrying out intricate or dense arithmetic or numerical functions.

Nybble. Half a byte, or four bits. (Or two shaves and two haircuts.)

Object code. A code in binary form, produced by an assembler or compiler program, A source code, by contrast, must be translated by an assembler or compiler before it can be executed by the CPU.

Octal. A base-8 numeration method often used with microcomputers. Numbers run from 0 to 7, and are identified with the suffix Q.

On-line. The state of being hooked up to an active computer, as in the case of a printer or disk drive that is connected and operational.

Operating system. The program(s) that supplies the computer system with its operating information, including start-up instructions at the time the system is turned on and supervisory instructions each time a new program is loaded.

Output. The path system that channels information out of a computer (usually to a screen or printer).

Overstriking. A method of producing boldface type by directing the printer to hit a character more than once.

Parallel. An input/output system that submits 8 bits of data at a time. An interface would have to be installed between a computer's serial port and a parallel printer, for example.

PASCAL. A more sophisticated programming language than BASIC, using less memory and producing faster programs. Named after Blaise Pascal.

PEEK. A programming command generally meaning: examine (specified location) and report the value that is represented there.

Peripheral. A hardware accessory to a computer, such as a printer or a modem.

Pixel. Picture element. A dot of light on a TV or computer screen, the smallest light fragment that the computer can address. Graphics with high resolution are generally composed of very small, and therefore numerous pixels.

Plotter. Machine for printing lines or graphs.

POKE. A programming command that is used to place a new value into a specified memory location.

Printer. Machine used to print computer information onto paper. See dot matrix, letter quality, daisy wheel.

Program. As a noun: a set of instructions given to a computer to enable it to perform a particular function. As a verb: to input such information into a computer.

Programming language. A language used in the composition of a computer program.

PROM. Programmable Read Only Memory. A permanent storage system for data that can be programmed both by the manufacturer and by the user.

Quad-density. Refers to a two-sided, double-density disk which is able to store four times the information of a one-sided, normal density disk.

RAM. Random Access Memory. Volatile storage system for data that can be changed—added to, subtracted from, rearranged—by the user. Information stored in RAM must be saved before the system is shut off or it will be lost.

Read/write. Signifies that information can be both read from and written into memory (RAM or permanent storage).

Resolution. A measure of the sharpness of a CRT (cathode ray tube) picture. Expressed in pixels, it can refer to either the number of scanning lines on the terminal or the number of addressable pixels on the screen.

Reverse video. The displaying of dark characters on a light background.

RF Modulator. Used to change computer video signals into radio frequency signals that can be picked up by a TV antenna and displayed.

RGB. Video signal composed of red, green, and blue that has much higher resolution and brighter colors than the standard composite color TV signals. A monitor with three separate electron guns, rather than the single gun used by the average color TV, is required.

ROM. Read Only Memory. Data that is built into a computer or software, and cannot be changed, such as the information that operates the computer immediately after start-up. In a computergame, for example, backgrounds which do not change or are not affected by gameplay are ROM. Spaceships and projectiles, which constantly are updated, are RAM.

Save. Recording information from the computer's memory onto tape or a disk.

Scrolling. Moving up and down (or from left to right) through the displayed information contained in the computer's memory, only a certain portion of which can be displayed on the terminal screen at one time.

Sector. A part of the track of a storage disk.

Serial. An input or output system that submits one bit of data at a time.

Serial port. A computer's input or output port through which data is transmitted in serial fashion. This is generally done, with home computers, through an RS232C serial interface port.

Single-sided. A disk with only one side that can store data.

Software. Programs to run on a computer on tape, disk, or cartridge. Everything from *Donkey Kong* to *Data Base*.

Source code. Program written in English-like words via an editor program which needs to be translated (with an assembler or compiler) into a language the computer understands.

Sprite. A high resolution programmable object. Any graphic figure is a sprite; sprites can be changed and animated through commands in BASIC

Syntax. Rules of grammatical usage governing programming language, as with English and other languages.

Terminal. The screen that displays computer information.

Text. The words and numbers displayed on the CRT screen.

Tractor feed. Mechanism that holds fan-fold paper in place and moves it through the printer, using sprockets that fit into the holes on both sides of the paper.

Volatile storage. A storage device, such as RAM, that loses the data it contains when power is cut off.

Winchester. A variety of hard disk that is sealed in a container.

Word processor. Can refer to the complete system, usually consisting of computer, display, memory storage, and printer, that is used to produce written documents; also refers to a software program that enables a computer to perform word processing functions.

Write. The process of transferring data from memory to permanent storage.

Write protection. Process that prevents writing to, or erasing from, a disk. With 8-inch disks, this is accomplished by removing a tab from the jacket; With 5¼ disks, by affixing the tab to the jacket.

PROGRAM LISTINGS

On the following pages, there are listed several programs that you might wish to try out on your own computer. Before you do so, there are a few things that you will need to know.

Certain computer commands are displayed on the monitor by various odd looking characters. To get your computer to *print* these command symbols (rather than perform the action of the command) you need to enter the quote mode. To do so, hold down the SHIFT key and press the "2" key; a pair of quotation marks will appear. This tells the computer that the next symbol is to be represented by a character. To get out of the quote mode just type in another set of quotation marks. You will also enter the quote mode when you INserT spaces or characters into a line. The easiest way to get out of the quote mode is to hit the RETURN key.

In Ahoy's program listings, you will run into letters and/or numbers surrounded by a pair of brackets. You will notice that these brackets appear neither on your keyboard nor in your printed programs. You, in all probability, use a dot matrix printer, but for the purpose of reproduction, we at *AHOY!* use a letter quality printer that is capable of reproducing the command symbols.

Thus, when you are in the quote mode and press the SHIFT and CLR/HOME keys at the same time, your screen (and dot matrix printer) would indicate this command with a character that looks like a heart ( ) . Since a letter quality printer is unable to duplicate this symbol it substitutes an alternate code that is listed within the brackets { }. In the case of the SHIFT CLR/HOME symbol, our printer will print {SC}. What this command does is tell the computer to clear the screen, and return to the "home" position (top left of the screen).

Below are listed a series of commands, the character that represents them on the screen or dot matrix printer, and how they appear in an *AHOY!* program listing.

When You See	It Means	You Type	You Will See	When You See	It Means	You Type	You Will See
{SC}	Screen Clear	SHIFT CLR/HOME		{OR}	Orange	COMMODORE 1	
{HM}	Home	CLR/HOME		{BR}	Brown	COMMODORE 2	
{CU}	Cursor Up	SHIFT ↑ CRSR ↓		{LR}	Light Red	COMMODORE 3	
{CD}	Cursor Down	↑ CRSR ↓		{G1}	Grey 1	COMMODORE 4	
{CL}	Cursor Left	SHIFT ← CRSR →		{G2}	Grey 2	COMMODORE 5	
{CR}	Cursor Right	← CRSR →		{LG}	Light Green	COMMODORE 6	
{RV}	Reverse On	CNTRL 9		{LB}	Light Blue	COMMODORE 7	
{RO}	Reverse Off	CNTRL 0		{G3}	Grey 3	COMMODORE 8	
{BK}	Black	CNTRL 1		{F1}	Function 1	F 1	
{WH}	White	CNTRL 2		{F2}	Function 2	F 2	
{RD}	Red	CNTRL 3		{F3}	Function 3	F 3	
{CY}	Cyan	CNTRL 4		{F4}	Function 4	F 4	
{PU}	Purple	CNTRL 5		{F5}	Function 5	F 5	
{GN}	Green	CNTRL 6		{F6}	Function 6	F 6	
{BL}	Blue	CNTRL 7		{F7}	Function 7	F 7	
{YL}	Yellow	CNTRL 8		{F8}	Function 8	F 8	

MULTI-DRAW 64

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```
•2 REM ******************************
*********************************
**************
•3 REM MAKE SURE YOU RAISED BASIC
BY    TYPING   POKE44,64:POKE64*2
56,0:NEW
•4 REM BEFORE ENTERING OR LOADING
THIS !!**************************
**************
•5 ONAGOTO981,982,983
•6 IFPEEK(44)<>64THENPRINT"{SC}{CD
}BASIC HAS NOT BEEN MOVED. RESTAR
T !!!":LIST2-4
•7 POKE3846,226:POKE53281,6:POKE53
280,14:POKE178,0:POKE179,16:PRINT
"{LB}"
•10 PRINT"{SC}{CD}{CD}{CD}
     MULTI-DRAW 64"
•15 PRINT"{CD}              BY: PET
E LOBL"
•16 PRINT"{CD}            VERSION
9/19/83"
•20 PRINT"{CD}{CD}{CD}{CD}{CD}PLEA
SE WAIT, READING IN MACHINE CODE.
.."
•30 DIMC$(15),CH%(11):P$="{HM}":FO
RI=1TO22:P$=P$+"{CD}":NEXT:FORI=0
TO15:READC$(I):NEXT
•40 FORI=1TO10:READX%(I),Y%(I):NEX
T
•50 C1=6:C2=2:C3=1:CC=1:K$="JOY":K
=0:P=1:PE$="DOW":TB=14:MB=15:X=64
:Y=88:CE=6
•60 PE=1:MV=1:FS$="FAS":FS=1:PL=86
4:CL=3072:RV=3200:FL=3328:RJ=3584
:IN=3712
•65 POKE2040,35:POKE2041,39:POKE20
42,43:POKE2043,47:POKE53277,15:PO
KE53271,4
•67 FORI=53287TO53291:POKEI,1:NEXT
:POKE53264,7:CX=828:CY=829
•68 FORI=53248TO53252STEP2:POKEI,3
2:NEXT
•69 POKE53251,128:POKE53249,104:PO
KE53253,170
•70 GOSUB1000: REM READ IN ML
•80 FORI=1TO63:READA:POKE2240+I,A:
NEXT:POKE2240,99
•82 FORI=0TO63:READA:POKE2496+I,A:
NEXT
•84 FORI=0TO63:READA:POKE2752+I,A:
NEXT
•86 FORI=0TO63:READA:POKE3008+I,A:
NEXT
•88 FORI=0TO35:READA:POKE4608+I,A:
NEXT
•90 YC=53255:XC=53254:X1=6:Y1=43
•92 POKEXC,X*2+X1:POKEYC,Y+Y1:SYSI
N:POKE53274,241:POKE56334,0:SYSCL
•93 POKE689,TB:POKE704,MB:POKE5326
9,15:PRINTP$"{BL}":GOSUB990:GOSUB
840:POKE53280,C1
•94 POKE848,CC:POKE849,C1:POKE850,
C2:POKE851,C3:POKE53269,7
•96 FORI=0TO175:POKECY,I:POKECX,0:
SYSPL:POKECX,124:SYSPL:NEXT
•98 FORI=0TO124:POKECX,I:POKECY,0:
SYSPL:POKECX,I:POKECY,175:SYSPL:N
EXT
•99 POKE53269,15:POKE198,0:H=124:H
Y=175
•100 IFKTHEN120
•105 POKE650,.:SYSRJ:A=PEEK(679):I
FA=.THEN120
•107 Q=X%(A)*MV+X:R=Y%(A)*MV+Y:IFQ
>HTHENQ=Q-H-1:GOTO109
•108 IFQ<.THENQ=H+Q+1
•109 IFR>HYTHENR=R-HY-1:GOTO111
•110 IFR<.THENR=HY+R+1
•111 X=Q:Y=R:POKECX,X:POKECY,Y:IFP
ETHENSYSPL
•112 IFFS=0THENGOSUB850
•113 POKEXC,X*2+X1:POKEYC,Y+Y1:GOT
O100
•120 GETA$:IFA$=""THEN100
•121 IFK=0THEN138
•122 POKE650,128:IFA$<>"I"THEN124
•123 A=2:GOTO107
•124 IFA$<>"U"THEN126
•125 A=8:GOTO107
•126 IFA$<>"J"THEN128
•127 A=6:GOTO107
•128 IFA$<>"N"THEN130
•129 A=10:GOTO107
•130 IFA$<>"M"THEN132
•131 A=4:GOTO107
•132 IFA$<>","THEN134
•133 A=7:GOTO107
•134 IFA$<>"K"THEN136
•135 A=3:GOTO107
```

```
•136 IFA$<>"O"THEN138
•137 A=5:GOTO107
•138 POKE198,0:IFA$<>"-"THEN141
•139 IFKTHENK=0:K$="JOY":GOSUB990:
 GOSUB840:GOTO100
•140 K=1:K$="KEY":GOSUB990:GOSUB84
 0:GOTO100
•141 IFA$<>"E"THEN143
•142 CC=0:POKE848,0:GOSUB990:GOSUB
 840:GOTO100
•143 IFA$="R"THENSYSRV:GOTO100
•145 IFA$="{F7}"THENA=PEEK(704):A=
 (A+1)*-(A<15):POKE704,A:GOTO100
•146 IFA$="{F8}"THENA=PEEK(704):A=
 A-1:A=A+((SGN(A)=-1)*(-16)):POKE7
 04,A:GOTO100
•147 IFA$="^"THENA=PEEK(689):A=(A+
 1)*-(A<15):POKE689,A:GOTO100
•148 IFA$="*"THENA=PEEK(689):A=A-1
 :A=A+((SGN(A)=-1)*(-16)):POKE689,
 A:GOTO100
•149 IFA$="/"THENA=PEEK(53290):A=(
 A+1)*-(A<255):POKE53290,A:GOTO100
•150 IFA$="?"THENA=PEEK(53290):A=A
 -1:A=A+((SGN(A)=-1)*(-256)):POKE5
 3290,A:GOTO100
•153 IFA$<>"\"THEN156
•154 IFFSTHENFS=0:FS$="SLO":GOTO18
 0
•155 FS=1:FS$="FAS":GOTO180
•156 IFA$<>"+"THEN159
•157 IFPEEK(53269)=15THENPOKE53269
 ,7:GOTO100
•158 POKE53269,15:GOTO100
•159 IFA$<>"P"THEN162
•160 IFPETHENPE=0:PE$="UP ":GOSUB9
 90:GOSUB840:GOTO100
•161 PE=1:PE$="DOW":GOSUB990:GOSUB
 840:GOTO100
•162 IFA$<>"{HM}"THEN164
•163 SYSCL:GOSUB990:GOSUB840:GOTO9
 0
•164 IFA$<>"L"THEN166
•165 GOSUB950:GOSUB990:GOSUB840:GO
 TO100
•166 IFA$<>"S"THEN168
•167 GOSUB900:GOSUB990:PRINTP$"{CD
 }{CD}{CU}{CU}":GOSUB840:GOTO100
•168 IFA$<>"M"THEN170
•169 GOSUB182:POKE53269,0:GOSUB860
 :GOSUB870:POKE3846,226:POKE53269,
 15:GOTO184
•170 IFA$<>"X"THEN200
•171 POKE53269,0:GOSUB860:PRINT"{S
 C}{CD}I HOPE YOU HAD FUN, SEE YA'
 NEXT TIME"
•172 PRINT"{CD}OH, WHY DON'T YOU E
 XPERIMENT WITH"
•173 PRINT"{CD}LOCATION 3846. POKE
  DIFFERENT NUMBERS"
•174 PRINT"{CD}THERE.  YOU MAY NOT
  KNOW IT, BUT YOU'LL"
•175 PRINT"{CD}BE CONTROLLING THE
 RASTER INTERRUPT!!!"
•176 PRINT"{CD}{CD}{CD}TILL NEXT T
 IME, HAVE FUN..............":END
•180 GOSUB990:GOSUB840:GOTO100
•182 PRINTP$" {RV}             PLEA
 SE WAIT               {RO}"P$
•183 A=5376:B=1024:C=2023:FORI=BTO
 C:POKEA,PEEK(I):A=A+1:NEXT:RETURN
•184 A=5376:B=1024:C=2023:FORI=BTO
 C:POKEI,PEEK(A):A=A+1:NEXT:GOSUB8
 40:GOTO100
•199 REM COMMANDS CONTINUED ****
•200 IFA$<>"Q"THEN204
•201 GOSUB990:PRINTP$:INPUT"{RV}NE
 W INCREMENT ";A$:A=INT(VAL(A$)):I
 FA<1THENA=1
•202 IFA>9THENA=9
•203 MV=A:GOSUB990:GOSUB840:GOTO10
 0
•204 IFA$<>":"THEN209
•205 A=CE:A=(A+1)*-(A<15):POKE848+
 CC,A:GOSUB990:CE=A:POKE53280,CE
•206 IFCC=2THENC2=A:GOSUB840:GOTO1
 00
•207 IFCC=3THENC3=A:GOSUB840:GOTO1
 00
•208 C1=A:GOSUB840:GOTO100
•209 IFA$<>"D"THEN214
•210 A=CE:A=A-1:A=A+((SGN(A)=-1)*(
 -16)):GOSUB990:CE=A:POKE53280,CE
•211 POKE848+CC,A:IFCC=2THENC2=A:G
 OSUB840:GOTO100
•212 IFCC=3THENC3=A:GOSUB840:GOTO1
 00
•213 C1=A:GOSUB840:GOTO100
•214 IFA$<>"{F1}"THEN216
•215 POKE848,1:CE=C1:CC=1:POKE5328
 0,CE:GOSUB990:GOSUB840:GOTO100
•216 IFA$<>"{F3}"THEN218
•217 POKE848,2:CE=C2:CC=2:POKE5328
 0,CE:GOSUB990:GOSUB840:GOTO100
•218 IFA$<>"{F5}"THEN220
•219 POKE848,3:CE=C3:CC=3:POKE5328
```

```
0,CE:GOSUB990:GOSUB840:GOTO100
•220 IFA$<>"F"THEN100
•221 GOSUB990:PRINTP$:INPUT"COLOR
# ";A$:A=INT(VAL(A$)):IFA<1ORA>3T
HENA=1
•222 POKE674,A:GOSUB990:PRINTP$:IN
PUT"COLOR VALUE ";A$:A=INT(VAL(A$
))
•223 IFA<0ORA>15THENA=0
•224 POKE675,A:SYSFL:GOSUB990:GOSU
B840:GOTO100
•840 REM PRINT BOTTOM 3 LINES ****
*
•841 GOSUB990:PRINTP$"{RV}NUM{RO}"
STR$(CC)" {RV}COL{RO} "C$(CE)" {R
V}"K$"{RO} {RV}INC{RO}"STR$(MV);
•842 PRINT" {RV}PEN{RO} "PE$" {RV}
SPE{RO} "FS$
•843 PRINT"{RV}COL1{RO} "C$(C1)" {
RV}COL2{RO} "C$(C2)" {RV}COL3{RO}
 "C$(C3)" {RV}X{RO}"X;
•844 PRINT"{RV}Y{RO}"Y
•845 RETURN
•850 REM PRINT NEW X AND Y *****
•851 PRINTP$"{CD}"TAB(27)"{RV}X{RO
}         {CL}{CL}{CL}{CL}{CL}{C
L}{CL}{CL}{CL}{CL}"X"{RV}Y{RO}"Y:
RETURN
•860 REM MOVE RASTER UP *******
•865 POKE3846,0:RETURN
•867 LOC.3846 = LOCATION TO START
PUTTING    THE NORMAL TEXT AT (Y
COORDINATE)
•870 REM LIST COMMANDS *****
•872 PRINT"{SC}  U  I  O"
•874 PRINT"   \|/ "
•876 PRINT"  J—+—K    KEYS TO MOV
E CURSOR"
•878 PRINT"   /|\     ( OR USE JO
YSTICK )"
•880 PRINT"  N  M  ,"
•881 PRINT"{CD}P = TOGGLES BETWEEN
 PEN UP AND PEN DOWN"
•882 PRINT"F1,F3,F5 = CHANGE TO CO
LORS 1,2,3"
•883 PRINT": = INCREMENT CURRENT C
OLOR"
•884 PRINT"D = DECREMENT CURRENT C
OLOR"
•885 PRINT"- = TOGGLES JOYSTICK/KE
Y MOVEMENT"
•886 PRINT"S = SAVE SCREEN"
•887 PRINT"L = LOAD SCREEN"
•888 PRINT"F7,F8 = INC/DEC HI-RES
BACKGROUND COLOR"
•889 PRINT"E = CHANGE TO ERASE MOD
E (COLOR 0)"
•890 PRINT"[HOME] = CLEARS HI-RES
SCREEN"
•891 PRINT"+ = TOGGLES CURSOR ON/O
FF"
•892 PRINT"F = FILLS SCREEN WITH A
 COLOR"
•893 PRINT"R = REVERSES SCREEN"
•894 PRINT"Q = CHANGE CURSOR INCRE
MENT"
•895 PRINT"\ = TOGGLE FAST/SLOW CU
RSOR MOVEMENT"
•896 PRINT"/,[SHIFT]/ = INC/DEC CU
RSOR COLOR"
•897 PRINT"^,* = INC/DEC TEXT BACK
GROUND"
•898 PRINT"X = EXITS PROGRAM"
•899 PRINT"{RV}HIT SPACE BAR TO RE
TURN{RO}{HM}":WAIT197,32,0:RETURN
•900 REM SAVE SUB******
•902 NA$="":GOSUB990
•905 PRINTP$;:INPUT"{CD}NAME OF SC
REEN    {CL}{CL}{CL}";NA$
•910 PRINTP$;:INPUT"{CD}TAPE OR DI
SK (T/D)          {CL}{CL}{CL}{CL}
{CL}{CL}{CL}{CL}";DV$
•915 IFNA$=""ANDDV$="D"THENRETURN
•920 IFLEN(NA$)>15THENRETURN
•921 GOSUB990
•922 PRINTP$" {RV}              PLEA
SE WAIT               {RO}"P$
•925 POKE3846,0:IFDV$="T"THEND=1:G
OTO927
•926 D=8
•927 POKE4611,D:POKE4618,LEN(NA$)+
1:A=1:NA$=NA$+"1"
•928 PRINTP$;:FORI=1TOLEN(NA$):POK
E4863+I,ASC(MID$(NA$,I,1)):NEXT
•929 IFA=1THENPOKE4627,4:POKE4631,
0:POKE4639,7:POKE4637,127
•931 IFA=2THENPOKE4627,32:POKE4631
,0:POKE4639,62:POKE4637,0
•933 IFA=3THENPOKE4627,216:POKE463
1,0:POKE4639,219:POKE4637,127
•935 SYS4608:NA$=LEFT$(NA$,LEN(NA$
)-1)
•937 A=A+1:IFA=2THENNA$=NA$+"2":GO
TO928
•939 IFA=3THENNA$=NA$+"3":GOTO928
•941 GOSUB990:PRINT"{HM}":POKE3846
```

```
,226:POKE56334,0:RETURN
•950 REM LOAD SUB******
•952 NA$="":GOSUB990
•955 PRINTP$;:INPUT"{CD}NAME OF SC
REEN    {CL}{CL}{CL}";NA$
•960 PRINTP$;:INPUT"{CD}TAPE OR DI
SK (T/D)            {CL}{CL}{CL}{CL}
{CL}{CL}{CL}{CL}";DV$
•965 IFNA$=""ANDDV$="D"THENRETURN
•970 IFLEN(NA$)>15THENRETURN
•972 GOSUB990
•975 PRINTP$"{CD}{CD} {RV}
   PLEASE WAIT                {RO
}"P$;
•976 POKE3846,0:IFLEFT$(DV$,1)="T"
THEND=1:GOTO980
•977 D=8
•980 PRINTP$"{CU}";:NA$=NA$+"1":A=
1:LOADNA$,D,1
•981 PRINTP$"{CU}";:A=A+1:NA$=LEFT
$(NA$,LEN(NA$)-1):NA$=NA$+"2":LOA
DNA$,D,1
•982 PRINTP$"{CU}";:A=A+1:NA$=LEFT
$(NA$,LEN(NA$)-1):NA$=NA$+"3":LOA
DNA$,D,1
•983 POKE3846,226:POKE56334,0:GOSU
B990:GOSUB840:GOTO100
•990 REM CLEAR TEXT *****
•992 FORI=1904TO2023:POKEI,32:NEXT
:RETURN
•1000 FORI=1TO11:READCH%(I):NEXT
•1010 B=1:T=0
•1020 READA$:TE=VAL(A$):IFA$="E"TH
EN1040
•1025 IFA$="F"THEN1050
•1030 T=T+TE:GOTO1020
•1040 IFT=CH%(B)THENB=B+1:T=0:GOTO
•1020
•1045 PRINT"{CD}ERROR IN DATA BLOC
K"B:END
•1050 IFT=CH%(B)THEN1060
•1055 PRINT"{CD}ERROR IN DATA BLOC
K"B:END
•1060 PRINT"{CD}DATA CORRECT, NOW
ENTERING..."
•1065 RESTORE:FORI=1TO47:READA$:NE
XT
•1070 A=864:B=953:GOSUB1200:A=2048
:B=2200:GOSUB1200:A=2304:B=2468:G
OSUB1200
•1080 A=2560:B=2728:GOSUB1200:A=28
16:B=2932:GOSUB1200:A=3072:B=3174
:GOSUB1200
•1090 A=3200:B=3237:GOSUB1200:A=33
28:B=3465:GOSUB1200:A=3584:B=3635
:GOSUB1200
•1100 A=3712:B=3746:GOSUB1200:A=38
40:B=3920:GOSUB1200
•1150 PRINT"{CD}DATA ENTERED !!!":
RETURN
•1200 FORI=ATOB:READT:POKEI,T:NEXT
:READA$:RETURN
•2999 REM COLOR TRANSLATE DATA ***
**
•3000 DATABLK,WHT,RED,CYN,PUR,GRN,
BLU,YEL,ORG,BRN,LRD,DGR,MGR,LGN,L
BL,LGR
•3009 REM JOYSTICK ARRAY DATA ****
**
•3010 DATA,,-1,1,,,1,1,-1,-1,,1,1
,-1,-1,,,-1,1
•5900 REM CHECKSUMS *****
•5910 DATA10078,18217,19331,19145,
•13292,10587,4275,12661,4922,3396,
9730
•6000 REM BLOCK 1 *******
•6005 DATA14,60,3,173,66,3,201,1,2
40,19,162,0,189,170,3,157,66,3
•6010 DATA189,178,3,157,84,3,232,2
24,8,208,239,160,0,132,249,169,32
•6020 DATA133,250,173,80,3,240,20,
201,3,240,19,132,253,162,4,134,25
4
•6030 DATA201,1,240,3,76,0,9,76,0,
10,76,0,11,132,251,169,216
•6040 DATA133,252,76,0,8,1,2,4,8,1
6,32,64,128,254,253,251,247
•6050 DATA239,223,191,127,E
•6060 REM BLOCK 2 *******
•6065 DATA173,60,3,74,74,74,141,62
,3,173,61,3,74,74,74,141,63,3
•6070 DATA173,61,3,41,7,141,64,3,1
73,60,3,41,7,141,65,3,169
•6080 DATA7,56,237,65,3,141,65,3,1
74,63,3,24,240,16,230,250,165
•6090 DATA249,105,64,133,249,144,3
,230,250,24,202,208,240,174,62,3,
240
•6100 DATA14,165,249,105,8,133,249
,144,3,230,250,24,202,208,242,165
,249
•6110 DATA109,64,3,133,249,144,3,2
30,250,24,174,65,3,160,0,189,66
•6120 DATA3,17,249,145,249,202,189
,66,3,17,249,145,249,174,63,3,24
•6130 DATA240,14,165,251,105,40,13
```

```
3,251,144,3,230,252,24,202,208,24
2,165
•6140 DATA251,109,62,3,133,251,144
,2,230,252,173,83,3,145,251,96,E
•6150 REM BLOCK 3 *******
•6155 DATA173,60,3,74,74,74,141,62
,3,173,61,3,74,74,74,141,63,3
•6160 DATA173,61,3,41,7,141,64,3,1
73,60,3,41,7,141,65,3,169
•6170 DATA7,56,237,65,3,141,65,3,1
74,63,3,24,240,16,230,250,165
•6180 DATA249,105,64,133,249,144,3
,230,250,24,202,208,240,174,62,3,
240
•6190 DATA14,165,249,105,8,133,249
,144,3,230,250,24,202,208,242,165
,249
•6200 DATA109,64,3,133,249,144,3,2
30,250,24,174,65,3,160,0,189,66
•6210 DATA3,17,249,145,249,202,189
,84,3,49,249,145,249,174,63,3,24
•6220 DATA240,14,165,253,105,40,13
3,253,144,3,230,254,24,202,208,24
2,165
•6230 DATA253,109,62,3,133,253,144
,2,230,254,173,82,3,41,15,141,62
•6240 DATA3,177,253,41,240,13,62,3
,145,253,96,E
•6250 REM BLOCK 4 *******
•6255 DATA173,60,3,74,74,74,141,62
,3,173,61,3,74,74,74,141,63,3
•6260 DATA173,61,3,41,7,141,64,3,1
73,60,3,41,7,141,65,3,169
•6270 DATA7,56,237,65,3,141,65,3,1
74,63,3,24,240,16,230,250,165
•6280 DATA249,105,64,133,249,144,3
,230,250,24,202,208,240,174,62,3,
240
•6290 DATA14,165,249,105,8,133,249
,144,3,230,250,24,202,208,242,165
,249
•6300 DATA109,64,3,133,249,144,3,2
30 ,250,24,174,65,3,160,0,189,84
•6310 DATA3,49,249,145,249,202,189
,66,3,17,249,145,249,174,63,3,24
•6320 DATA240,14,165,253,105,40,13
3,253,144,3,230,254,24,202,208,24
2,165
•6330 DATA253,109,62,3,133,253,144
,2,230,254,173,81,3,41,15,10,10
•6340 DATA10,10,141,62,3,177,253,4
1,15,13,62,3,145,253,96,E
•6350 REM BLOCK 5 *******
•6355 DATA173,60,3,74,74,74,141,62
,3,173,61,3,74,74,74,141,63,3
•6360 DATA173,61,3,41,7,141,64,3,1
73,60,3,41,7,141,65,3,169
•6370 DATA7,56,237,65,3,141,65,3,1
74,63,3,24,240,16,230,250,165
•6380 DATA249,105,64,133,249,144,3
,230,250,24,202,208,240,174,62,3,
240
•6390 DATA14,165,249,105,8,133,249
,144,3,230,250,24,202,208,242,165
,249
•6400 DATA109,64,3,133,249,144,3,2
30,250,24,174,65,3,160,0,189,84
•6410 DATA3,49,249,145,249,202,189
,84,3,49,249,145,249,96,E
•6420 REM BLOCK 6 *******
•6425 DATA160,0,162,32,142,67,12,2
32,142,70,12,232,142,73,12,232,14
2,76
•6430 DATA12,173,33,208,10,10,10,1
0,141,176,2,173,33,208,41,15,13
•6440 DATA176,2,153,0,216,153,0,21
7,153,0,218,153,232,218,153,0,4
•6450 DATA153,0,5,153,0,6,153,232,
6,200,208,229,152,153,0,60,153
•6460 DATA0,61,153,0,62,153,0,63,2
00,208,241,174,67,12,224,60,240
•6470 DATA15,238,67,12,238,70,12,2
38,73,12,238,76,12,76,65,12,96,E
•6480 REM BLOCK 7 *******
•6485 DATA160,0,162,32,142,140,12,
142,145,12,185,0,32,73,255,153,0,
32,200
•6490 DATA208,245,173,140,12,201,6
3,240,9,238,140,12,238,145,12,76,
138,12,96,E
•6540 REM BLOCK 8 *******
•6545 DATA160,0,173,163,2,174,162,
2,224,1,240,20,224,2,240,71,153
•6550 DATA0,216,153,0,217,153,0,21
8,153,0,219,200,208,241,96,10,10
•6560 DATA10,10,141,164,2,185,0,4,
41,15,13,164,2,153,0,4,185,0
•6570 DATA5,41,15,13,164,2,153,0,5
,185,0,6,41,15,13,164,2
•6580 DATA153,0,6,185,232,6,41,15,
13,164,2,153,232,6,200,208
•6590 DATA209,96,141,164,2,185,0,4
,41,240,13,164,2,153,0,4,185
•6600 DATA0,5,41,240,13,164,2,153,
0,5,185,0,6,41,240,13,164
•6610 DATA2,153,0,6,185,232,6,41,2
```

```
40,13,164,2,153,232,6,200,208,209
,96,E
•6620 REM BLOCK 9 *******
•6625 DATA169,0,141,167,2,173,0,22
0,106,176,9,162,2,142,167,2,106
•6630 DATA76,28,14,106,176,5,162,4
,142,167,2,106,176,9,173,167,2
•6640 DATA105,6,141,167,2,96,106,1
76,8,173,167,2,105,3,141,167,2,96
,E
•6650 REM BLOCK 10 *******
•6655 DATA120,169,15,141,21,3,169,
0,141,20,3,141,178,2,141,18,208
•6660 DATA173,17,208,41,127,141,17
,208,173,25,208,9,1,141,25,208,88
,96,E
•6670 REM BLOCK 11 *******
•6675 DATA173,178,2,208,37,169,226
,141,18,208,169,59,141,17,208,173
,192
•6680 DATA2,141,33,208,169,29,141,
24,208,169,24,141,22,208,169,1,14
1
•6690 DATA25,208,141,178,2,76,49,2
34,169,252,141,18,208,169,27,141,
17
•6700 DATA208,173,177,2,141,33,208
,169,21,141,24,208,169,8,141,22,2
08
•6710 DATA169,1,141,25,208,169,0,1
41,178,2,76,129,234,F
•6999 REM SPRITE DATA ********
•7000 DATA74,250,85,74,34,73,74,34
,65,74,34,65,74,34,65,123,162
•7010 DATA0,0,0,49,198,68,41,41,68
,37,41,68,37,207,84,41,41
•7020 DATA84,49,41,40,0,0,0,1,196,
0,2,4,128,2,4,128,3
•7030 DATA199,128,2,32,128,1,192,1
28,0,0,0,0,4,0,0,4,18
•7040 DATA0,7,146,64,4,158,0,7,130
,64,0,14,0,0,0,0,61
•7050 DATA239,188,37,2,32,61,194,5
6,33,2,32,33,226,60,0,8,0
•7060 DATA33,232,64,33,47,64,33,41
,64,61,239,120,0,0,0,0,0
•7070 DATA0,0,0,0,0,0,0,0,37,124,1
36,37,16,216,61,16,168
•7080 DATA37,16,136,37,16,136,0,0,
0,15,123,192,8,74,64,14,75
•7090 DATA128,8,74,64,8,122,64,0,0
,0,0,0,0,139,232,162,218
•7100 DATA12,162,171,138,162,138,9
,162,138,8,162,139,232,190,0,0,0
•7110 DATA0,0,0,0,0,0,0,0,0,0,0,0,
0,0,64,0,0
•7120 DATA64,0,1,240,0,1,16,0,7,28
,0,1,16,0,1,240,0
•7130 DATA0,64,0,0,64,0,0,0,0,0,0,
0,0,0,0,0,0
•7140 DATA0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0
•7200 REM SAVE ML DATA ******
•7210 DATA169,1,162,8,160,255,32,1
86,255,169,15,162,0,160,19,32,189
,255,169
•7220 DATA4,133,253,169,0,133,252,
169,252,162,127,160,7,32,216,255,
96
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INTERRUPT MUSIC MAKER

From page 22

```
•0 REMARKABLE EXAMPLE OF INTERRUPT
 DRIVEN MUSIC.
•1 REMNANTS OF MY OLD PIANO...  (C
) 1983 BY PETE LOBL RIVER CITY,
U.S.A.
•4 ONQQGOTO50
•5 POKE52,89:POKE56,89:CLR:H=1:POK
E53280,0:POKE53281,0
•7 PRINTCHR$(8):GOSUB10000:I=-RND(
TI)
•8 PRINT"{CD}{CD}{CD}{CD}{CD}WANT
TO RESET THE CLOCKS ? (Y/N) ";:GO
SUB5310:IFLEFT$(IN$,1)<>"Y"THEN20
•9 FORI=56331TO56328STEP-1:POKEI,0
:NEXT:FORI=56587TO56584STEP-1:POK
EI,0:NEXT
•20 A=PEEK(56328):B=PEEK(56584):PR
INT"{CD}PLEASE WAIT, READING IN D
ATA..."
•21 DIMO1%(12),O2%(12),O3%(12),O4%
(12),O5%(12),O6%(12),O7%(12),O8(1
2)
•23 DIMN$(15):FORI=1TO15:READN$(I)
:NEXT
•24 DIML$(5):FORI=1TO5:READL$(I):N
EXT
•25 DIMNS$(12):FORI=1TO12:READNS$(
I):NEXT
•26 DIMNF$(12):FORI=1TO12:READNF$(
I):NEXT
•27 DIMNU(15):FORI=1TO15:READNU(I)
```

```
:NEXT
•28 FORI=54272TO54296:POKEI,0:NEXT
•30 FORI=1TO12:READO1%(I):NEXT
•31 FORI=1TO12:READO2%(I):NEXT
•32 FORI=1TO12:READO3%(I):NEXT
•33 FORI=1TO12:READO4%(I):NEXT
•34 FORI=1TO12:READO5%(I):NEXT
•35 FORI=1TO12:READO6%(I):NEXT
•36 FORI=1TO12:READO7%(I):NEXT
•37 FORI=1TO12:READO8(I):NEXT
•40 V1=6*4096-1:V2=8*4096-1:T=0:O=
5:N=1:F1=8192:F2=F1:V=1:B1=V:B2=V
:A1=0:A2=A1
•41 SY=5*4096+10*256+48:YS=5*4096+
10*256+48+11:N2=N:SP=57:C1=23124:
C2=C1+41
•42 S$="SHORT ":L$="TIED ":L$(0)="
LENGTH =":Q$="{HM}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}{CD}{CD}{CD}{CD}{CD}
{CD}{CD}{CD}{CD}{CD}{CD}{CD}{CD}{
CD}{CD}"
•45 O2=O:T2=T:N2=N
•47 FORI=22784TO23205:READA:POKEI,
A:NEXT
•50 IFV=2THEN240
•51 PRINT"{SC}{WH}BLOCKS FREE";INT
(F1/3);"       :   :";
•52 PRINT"        VOICE 1":SYSC1
•53 PRINT"{CD}POSITION"TAB(16)N;TA
B(22)N+1;TAB(28)N+2
•55 PRINT"{CD}VALUES"TAB(16)PEEK(N
+V1)"   "PEEK(N+V1+1)"   "PEEK(N+V1
+2)
•58 PRINT"{CD}MEANING"TAB(10);:A=P
EEK(N+V1):B=PEEK(N+V1+1):C=PEEK(N
+V1+2)
•60 IFA=0THENPRINT"AT/DEC ="B"SUS/
REL ="C:GOTO100
•63 J=0:FORI=1TO15:IFA=NU(I)THENJ=
I
•64 NEXT:IFJ=0THENPRINTL$(0)A;:GOT
O80
•66 Z=INT(J/3):Y=J-Z*3:IFYTHENZ=Z+
1
•67 IFY=1THENPRINTS$;
•68 IFY=0THENPRINTL$;
•69 PRINTL$(Z)" ";
•80 J=B*256+C:FORI=1TO12:IFJ=O1%(I
)THENA=1:B=I:GOTO90
•82 IFJ=O2%(I)THENA=2:B=I:GOTO90
•83 IFJ=O3%(I)THENA=3:B=I:GOTO90
•84 IFJ=O4%(I)THENA=4:B=I:GOTO90
•85 IFJ=O5%(I)THENA=5:B=I:GOTO90
•86 IFJ=O6%(I)THENA=6:B=I:GOTO90
 87 IFJ=O7%(I)THENA=7:B=I:GOTO90
•88 IFJ=O8(I)THENA=8:B=I:GOTO90
•89 NEXT:IFJ>0THENPRINT" ? NOTE":G
OTO100
•90 I=13:IFJ=0THENPRINT" REST":GOT
O100
•92 NEXT:PRINTA;:IN$=NS$(B):A$=NF$
(B):IFA$=IN$THENPRINTA$:GOTO100
•94 PRINTIN$" ("A$")"
•100 PRINT"{HM}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}{CD}{CD}"
•102 PRINT"{CD}{RV}L{RO}=LOAD {RV}
S{RO}=SAVE {RV}G{RO}=GOTO {RV}N{R
O}=NEXT {RV}B{RO}=BACK"
•104 PRINT"{CD}{RV}C{RO}=CHANGE {R
V}P{RO}=PLAY {RV}T{RO}=TRANSFER {
RV}F{RO}=FIND {RV}?{RO}=DUMP"
•105 PRINT"{RV}H{RO}=HELP {RV}Z{RO
}=SPEED {RV}V{RO}=VOLUME {RV}E{RO
}=EDIT"
•106 PRINT"{HM}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}CURRENT BLOCK ="B1
•108 PRINT"{CD}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}{CD}OCTAVE "O"   TEM
PO "T"   SPEED "SP
•110 A$="":PRINT"{HM}{CD}{CD}{CD}{
CD}{CD}{CD}{CD}{CD}{CD}{CD}INPUT
: ";:H=.:GOSUB5310:H=1:A$=IN$
•111 IFLEFT$(A$,1)="H"ORA$="*H"THE
NGOSUB7000:GOTO50
•112 IFLEFT$(A$,1)="*"THEN141
•113 A=VAL(LEFT$(A$,1)):IFATHENGOS
UB422:O=A:GOTO116
•114 B$=LEFT$(A$,2):IFRIGHT$(B$,1)
=" "THENB$=LEFT$(B$,1)
•115 GOTO117
•116 B$=MID$(A$,2,2):IFRIGHT$(B$,1
)=" "THENB$=LEFT$(B$,1)
•117 J=0:FORI=1TO12:IFB$=NS$(I)THE
NJ=I
•118 NEXT:IFJTHEN122
•119 J=0:FORI=1TO12:IFB$=NF$(I)THE
NJ=I
•120 NEXT:IFJTHEN122
•121 GOTO402
•122 ONOGOSUB400,410,420,430,440,4
50,460,470
•123 B=INT(A/256):C=A-B*256:POKEV1
+N+1,B:POKEV1+N+2,C
•124 J=0:FORI=1TOLEN(A$):IFMID$(A$
,I,1)=" "THENJ=I
•125 NEXT:A$=RIGHT$(A$,LEN(A$)-J):
```

```
J=0:FORI=1TO15:IFA$=N$(I)THENJ=I
•126 NEXT:IFJ=0THEND=VAL(A$):GOTO1
28
•127 D=NU(J):GOTO130
•128 IFD>255THENPRINTQ$;"DURATION
TOO LARGE !!":GOSUB8000:GOTO50
•129 IFD<=0THENPRINTQ$;"DURATION C
AN'T BE LESS THAN 1 !!":GOSUB8000
:GOTO50
•130 D=D+T:IFD>255ORD<=0THEN128
•131 POKEN+V1,D:B1=B1+1:N=N+3:F1=F
1-3
•132 IFF1<1THENPRINTQ$"ALL BLOCKS
FULL FOR VOICE 1":GOSUB8000:GOTO4
26
•133 IFRIGHT$(A$,1)="H"ORRIGHT$(A$
,2)="H "THEN461
•134 IFVAL(A$)THEN138
•135 IFRIGHT$(A$,1)="S"ORRIGHT$(A$
,2)="S "THEN471
•136 POKEN+V1,1:POKEN+V1+1,0:POKEN
+V1+2,0:GOTO140
•137 POKEN+V1+2,0:GOTO140
•138 IFA1=0THEN50
•139 POKEN+V1,A1:POKEN+V1+1,0:GOTO
•137
•140 B1=B1+1:N=N+3:F1=F1-3:GOTO424
•141 A$=RIGHT$(A$,1):IFA$<>"G"THEN
•144
•142 PRINTQ$"TO WHAT BLOCK ? ";:GO
SUB5310:J=VAL(IN$):IFJ>2830ORJ<1T
HEN50
•143 B1=J:F1=8193-B1*3:N=B1*3-2:GO
TO50
•144 IFA$<>"N"THEN147
•145 J=B1:J=J+1:IFJ<2831THEN143
•146 GOTO50
•147 IFA$<>"B"THEN150
•148 J=B1:J=J-1:IFJ>0THEN143
•149 GOTO50
•150 IFA$<>"L"THEN152
•151 GOTO4000
•152 IFA$<>"P"THEN165
•153 IFP=1THENSYS5*4096+9*256+15*1
•6+10:POKE54296,0:P=0:GOTO50
•154 PRINT"{SC}{CD}WHICH VOICES DO
 YOU WANT ? (1/2/B) ";:GOSUB5310:
A$=IN$
•155 QQ=5*4096+9*256:IFA$="2"THENP
OKEQQ+68,0:POKEQQ+109,0:POKEQQ+21
,0:GOTO160
•156 PRINT"{CD}WHAT WAVEFORM FOR V
OICE 1 ? (T/S/P/N) ";:GOSUB5310:A
1=1:GOSUB433
157 POKEQQ+68,WV:POKEQQ+109,WV:PO
KEQQ+21,WV-1
•158 PRINT"{CD}WHAT BLOCK DOES IT
START AT ? ";:GOSUB5310:VV=1:GOSU
B452
•159 IFA$="1"THENSYSQQ+12*16:P=1:P
OKEQQ+114,0:POKEQQ+85,0:GOTO50
•160 PRINT"{CD}WHAT WAVEFORM FOR V
OICE 2 ? (T/S/P/N) ";:GOSUB5310:A
1=2:GOSUB433
•161 POKEQQ+114,WV:POKEQQ+85,WV-1
•162 PRINT"{CD}WHAT BLOCK DOES IT
START AT ? ";:GOSUB5310:VV=2:GOSU
B452
•163 SYSQQ+12*16:P=1:GOTO50
•165 IFA$<>"C"THEN185
•166 PRINT"{SC}{CD}YOUR CHOICE ? (
V/T/DSR/AU/TI/FS/X) ";:GOSUB5310:
IFIN$="X"THEN50
•167 IFIN$="T"THENPRINT"{CD}TEMPO
";:GOSUB5310:T=VAL(IN$):GOTO166
•168 IFIN$="DSR"THENPRINT"{CD}ATTA
CK/DECAY ? ";:GOSUB5310:A=VAL(IN$
):GOTO170
•169 GOTO172
•170 PRINT"{CD}SUSTAIN/RELEASE ? "
;:GOSUB5310:SR=VAL(IN$):IFA>255OR
SR>255THEN166
•171 POKEN+V1,0:POKEN+V1+1,A:POKEN
+V1+2,SR:B1=B1+1:N=N+3:F1=F1-3:GO
TO166
•172 IFIN$="V"THENV=V+1:V=V+2*(V=3
):GOTO166
•173 IFIN$="AU"THENPRINT"YOUR NEW
SEPERATION ? ";:GOSUB5310:A1=VAL(
IN$):GOTO166
•174 IFIN$<>"FS"THEN473
•175 PRINT"{SC}{CD}STARTING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{CD
}ENDING BLOCK ";:GOSUB5310
•176 J=VAL(IN$)-A:IFA<1THEN166
•177 PRINT"{CD}SLOWER OR FASTER ?
(S/F) ";:GOSUB5310:IFIN$="S"THENR
=2:K=1:GOTO179
•178 R=.5:K=0
•179 QQ=6*4096+A*3-3:FORI=QQTOQQ+J
*3STEP3:IFPEEK(I)<2THEN182
•180 A=INT(PEEK(I)*R)+K:IFA>255THE
NA=255
•181 POKEI,A
•182 NEXT:GOTO166
•185 IFA$<>"T"THEN195
```

```
•186 PRINT"{SC}{CD}BEGINNING BLOCK
 ";:GOSUB5310:A=VAL(IN$):PRINT"{C
D}ENDING BLOCK ";:GOSUB5310
•187 B=VAL(IN$):PRINT"{CD}ORIGIN V
OICE ";:GOSUB5310:C=VAL(IN$):J=B-
A:IFJ<1THEN50
•188 PRINT"{CD}DESTINATION BLOCK "
;:GOSUB5310:B=VAL(IN$):PRINT"{CD}
ENDING VOICE ";:GOSUB5310
•189 R=VAL(IN$):IFC=1THENQQ=6*4096
:GOTO191
•190 QQ=8*4096
•191 R=8*4096:IFR=1THENR=6*4096
•193 FORI=QQ+A*3-3TOQQ+A*3-3+J*3+2
:POKER+B*3-3,PEEK(I):R=R+1:NEXT
•194 GOTO50
•195 IFA$<>"X"THEN197
•196 SYS5*4096+9*256+15*16+10:POKE
54296,0:P=0:PRINTQ$CHR$(9)"{CU}{C
U}":GOTO20000
•197 IFA$<>"S"THEN210
•198 PRINT"{SC}{CD}STARTING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{CD
}ENDING BLOCK " ;:GOSUB5310
•199 B=VAL(IN$):PRINT"{CD}VOICE ";
:GOSUB5310:C=VAL(IN$):IFB-A<1THEN
50
•200 IFC=1ORC=2THEN202
•201 GOTO50
•202 QQ=8*4096:IFC=1THENQQ=6*4096
•204 R=QQ+A*3-3:QQ=R+B*3:LO=12*409
6+22:POKELO+1,INT(R/256)
•205 POKELO,R-(INT(R/256))*256:POK
ELO+3,INT(QQ/256):POKELO+2,QQ-(IN
T(QQ/256))*256
•206 PRINT"{CD}FILE NAME ? ";:GOSU
B5310:LO=LO-16:IFLEN(IN$)=0THENDV
=1:GOTO208
•207 FORI=1TOLEN(IN$):POKELO+I-1,A
SC(MID$(IN$,I,1)):NEXT:DV=1
•208 POKELO-1,LEN(IN$):PRINT"{CD}D
ISK OR TAPE ? (D/T) ";:GOSUB5310:
IFLEFT$(IN$,1)="D"THENDV=8
•209 POKE5*4096+10*256+10,DV:SYS5*
4096+10*256+7:GOTO50
•210 IFA$<>"F"THEN230
•211 PRINT"{SC}{CD}STARTING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{CD
}ENDING BLOCK ";:GOSUB5310
•212 B=VAL(IN$):B=B-A:IFB<1THEN50
•213 PRINT"{CD}VOICE ";:GOSUB5310:
C=VAL(IN$):IFC=1THENC=6*4096:GOTO
215
•214 C=8*4096
•215 QW=C:A=C+A*3-3:LO=12*4096+32-
1:C=1
•216 PRINT"{CD}MEMBER"C;:GOSUB5310
;:IFVAL(IN$)=0THEN220
•217 IFVAL(IN$)<0ORVAL(IN$)>255THE
N216
•218 POKEC+LO,VAL(IN$):C=C+1:GOTO2
16
•220 C=C-1:PRINT"{CD}SEARCHING FOR
 ";:FORI=1TOC:PRINTPEEK(LO+I);:NE
XT:PRINT
•221 FORI=ATOA+B*3:FORJ=1TOC:IFPEE
K(I+J-1)=PEEK(LO+J)THENNEXT:GOTO2
23
•222 J=C+1:NEXT:GOTO224
•223 QQ=(INT((I-QW)/3))+1:PRINT"{C
D}BLOCK"QQ"POSITION"QQ*3-(INT((I-
QW)/(QQ*3))+1)
•224 NEXT:PRINT"{CD}HIT A KEY TO C
ONTINUE."
•225 GETR$:IFR$=""THEN225
•226 GOTO50
•230 IFA$<>"E"THEN500
•231 PRINTQ$"WHAT POSITION ";:GOSU
B5310:A=VAL(IN$):PRINT"{CD}WHAT V
ALUE ";:GOSUB5310
•232 B=VAL(IN$):IFB>255ORA<0THEN50
•233 POKE6*4096+A-1,B:GOTO50
•240 PRINT"{SC}{WH}BLOCKS FREE";IN
T(F2/3);"    :   :";
•242 PRINT"         VOICE 2":SYSC2
•243 PRINT"{CD}POSITION"TAB(16)N2;
TAB(22)N2+1;TAB(28)N2+2
•245 PRINT"{CD}VALUES"TAB(16)PEEK(
N2+V2)"   "PEEK(N2+V2+1)"   "PEEK(N
2+V2+2)
•248 PRINT"{CD}MEANING"TAB(10);:A=
PEEK(N2+V2):B=PEEK(N2+V2+1):C=PEE
K(N2+V2+2)
•250 IFA=0THENPRINT"AT/DEC ="B"SUS
/REL ="C:GOTO280
•253 J=0:FORI=1TO15:IFA=NU(I)THENJ
=I
•254 NEXT:IFJ=0THENPRINTL$(0)A;:GO
TO260
•256 Z=INT(J/3):Y=J-Z*3:IFYTHENZ=Z
+1
•257 IFY=1THENPRINTS$;
•258 IFY=0THENPRINTL$;
•259 PRINTL$(Z)" ";
•260 REM
•261 J=B*256+C:FORI=1TO12:IFJ=01%(
```

```
I)THENA=1:B=I:GOTO270
•262 IFJ=02%(I)THENA=2:B=I:GOTO270
•263 IFJ=03%(I)THENA=3:B=I:GOTO270
•264 IFJ=04%(I)THENA=4:B=I:GOTO270
•265 IFJ=05%(I)THENA=5:B=I:GOTO270
•266 IFJ=06%(I)THENA=6:B=I:GOTO270
•267 IFJ=07%(I)THENA=7:B=I:GOTO270
•268 IFJ=08(I)THENA=8:B=I:GOTO270
•269 NEXT:IFJ>0THENPRINT" ? NOTE":
GOTO280
•270 I=13:IFJ=0THENPRINT" REST":GO
TO280
•272 NEXT:PRINTA;:IN$=NS$(B):A$=NF
$(B):IFA$=IN$THENPRINTA$:GOTO280
•274 PRINTIN$" ("A$")"
•280 PRINT"{HM}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}{CD}{CD}"
•282 PRINT"{CD}{RV}L{RO}=LOAD {RV}
S{RO}=SAVE {RV}G{RO}=GOTO {RV}N{R
O}=NEXT {RV}B{RO}=BACK {RV}E{RO}=
EDT";
•284 PRINT"{CD}{RV}C{RO}=CHANGE {R
V}P{RO}=PLAY {RV}T{RO}=TRANSFER {
RV}F{RO}=FIND {RV}?{RO}=DUMP"
•285 PRINT"{RV}H{RO}=HELP {RV}Z{RO
}=SPEED {RV}V{RO}=VOLUME {RV}E{RO
}=EDIT"
•286 PRINT"{HM}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}CURRENT BLOCK ="B2
•288 PRINT"{CD}{CD}{CD}{CD}{CD}{CD
}{CD}{CD}{CD}{CD}OCTAVE "O2"   TE
MPO "T2"  SPEED "SP
•290 A$="":PRINT"{HM}{CD}{CD}{CD}{
CD}{CD}{CD}{CD}{CD}{CD}{CD}INPUT
: ";:H=.:GOSUB5310:H=1:A$=IN$
•291 IFLEFT$(A$,1)="H"ORA$="*H"THE
NGOSUB7000:GOTO50
•292 IFLEFT$(A$,1)="*"THEN321
•293 A=VAL(LEFT$(A$,1)):IFATHENGOS
UB422:O2=A:GOTO296
•294 B$=LEFT$(A$,2):IFRIGHT$(B$,1)
=" "THENB$=LEFT$(B$,1)
•295 GOTO297
•296 B$=MID$(A$,2,2):IFRIGHT$(B$,1
)=" "THENB$=LEFT$(B$,1)
•297 J=0:FORI=1TO12:IFB$=NS$(I)THE
NJ=I
•298 NEXT:IFJTHEN302
•299 J=0:FORI=1TO12:IFB$=NF$(I)THE
NJ=I
•300 NEXT:IFJTHEN302
•301 GOTO1402
•302 ONO2GOSUB400,410,420,430,440,
450,460,470
•303 B=INT(A/256):C=A-B*256:POKEV2
+N2+1,B:POKEV2+N2+2,C
•304 J=0:FORI=1TOLEN(A$):IFMID$(A$
,I,1)=" "THENJ=I
•305 NEXT:A$=RIGHT$(A$,LEN(A$)-J):
J=0:FORI=1TO15:IFA$=N$(I)THENJ=I
•306 NEXT:IFJ=0THEND=VAL(A$):GOTO3
08
•307 D=NU(J):GOTO310
•308 IFD>255THENPRINTQ$;"DURATION
TOO LARGE !!":GOSUB8000:GOTO50
•309 IFD<=0THENPRINTQ$;"DURATION C
AN'T BE LESS THAN 1 !!":GOSUB8000
:GOTO50
•310 D=D+T2:IFD>255ORD<=0THEN308
•311 POKEN2+V2,D:B2=B2+1:N2=N2+3:F
2=F2-3
•312 IFF2<1THENPRINTQ$"ALL BLOCKS
FULL FOR VOICE 1":GOSUB8000:GOTO1
426
•313 IFRIGHT$(A$,1)="H"ORRIGHT$(A$
,2)="H "THEN1461
•314 IFVAL(A$)THEN318
•315 IFRIGHT$(A$,1)="S"ORRIGHT$(A$
,2)="S "THEN1471
•316 POKEN2+V2,1:POKEN2+V2+1,0:POK
EN2+V2+2,0:GOTO320
•317 POKEN2+V2+2,0:GOTO320
•318 IFA2=0THEN50
•319 POKEN2+V2,A2:POKEN2+V2+1,0:GO
TO317
•320 B2=B2+1:N2=N2+3:F2=F2-3:GOTO1
424
•321 A$=RIGHT$(A$,1):IFA$<>"G"THEN
324
•322 PRINTQ$"TO WHAT BLOCK ? ";:GO
SUB5310:J=VAL(IN$):IFJ>2830ORJ<1T
HEN50
•323 B2=J:F2=8193-B2*3:N2=B2*3-2:G
OTO50
•324 IFA$<>"N"THEN327
•325 J=B2:J=J+1:IFJ<2831THEN323
•326 GOTO50
•327 IFA$<>"B"THEN330
•328 J=B2:J=J-1:IFJ>0THEN323
•329 GOTO50
•330 IFA$<>"L"THEN332
•331 GOTO4000
•332 IFA$<>"P"THEN345
•333 IFP=1THENSYS5*4096+9*256+15*1
6+10:POKE54296,0:P=0:GOTO50
•334 PRINT"{SC}{CD}WHICH VOICES DO
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```
 YOU WANT ? (1/2/B) ";:GOSUB5310:
A$=IN$
•335 QQ=5*4096+9*256:IFA$="2"THENP
OKEQQ+68,0:POKEQQ+109,0:POKEQQ+21
,0:GOTO340
•336 PRINT"{CD}WHAT WAVEFORM FOR V
OICE 1 ? (T/S/P/N) ";:GOSUB5310:A
1=1:GOSUB433
•337 POKEQQ+68,WV:POKEQQ+109,WV:PO
KEQQ+21,WV-1
•338 PRINT"{CD}WHAT BLOCK DOES IT
START AT ? ";:GOSUB5310:VV=1:GOSU
B452
•339 IFA$="1"THENSYSQQ+12*16:P=1:P
OKEQQ+114,0:POKEQQ+85,0:GOTO50
•340 PRINT"{CD}WHAT WAVEFORM FOR V
OICE 2 ? (T/S/P/N) ";:GOSUB5310:A
1=2:GOSUB433
•341 POKEQQ+114,WV:POKEQQ+85,WV-1
•342 PRINT"{CD}WHAT BLOCK DOES IT
START AT ? ";:GOSUB5310:VV=2:GOSU
B452
•343 SYSQQ+12*16:P=1:GOTO50
•345 IFA$<>"C"THEN365
•346 PRINT"{SC}{CD}YOUR CHOICE ? (
V/T/DSR/AU/TI/FS/X) ";:GOSUB5310:
IFIN$="X"THEN50
•347 IFIN$="T"THENPRINT"{CD}TEMPO
";:GOSUB5310:T2=VAL(IN$):GOTO346
•348 IFIN$="DSR"THENPRINT"{CD}ATTA
CK/DECAY ? ";:GOSUB5310:A=VAL(IN$
):GOTO350
•349 GOTO352
•350 PRINT"{CD}SUSTAIN/RELEASE ? "
;:GOSUB5310:SR=VAL(IN$):IFA>255OR
SR>255THEN346
•351 POKEN2+V2,0:POKEN2+V2+1,A:POK
EN2+V2+2,SR:B2=B2+1:N2=N2+3:F2=F2
-3:GOTO346
•352 IFIN$="V"THENV=V+1:V=V+2*(V=3
):GOTO346
•353 IFIN$="AU"THENPRINT"YOUR NEW
SEPERATION ? ";:GOSUB5310:A2=VAL(
IN$):GOTO346
•354 IFIN$<>"FS"THEN1473
•355 PRINT"{SC}{CD}STARTING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{CD
}ENDING BLOCK ";:GOSUB5310
•356 J=VAL(IN$)-A:IFA<1THEN346
•357 PRINT"{CD}SLOWER OR FASTER ?
(S/F) ";:GOSUB5310:IFIN$="S"THENR
=2:K=1:GOTO359
•358 R=.5:K=0
•359 QQ=8*4096+A*3-3:FORI=QQTOQQ+J
*3STEP3:IFPEEK(I)<2THEN362
•360 A=INT(PEEK(I)*R)+K:IFA>255THE
NA=255
•361 POKEI,A
•362 NEXT:GOTO346
•365 IFA$<>"T"THEN375
•366 PRINT"{SC}{CD}BEGINNING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{C
D}ENDING BLOCK ";:GOSUB5310
•367 B=VAL(IN$):PRINT"{CD}ORIGIN V
OICE ";:GOSUB5310:C=VAL(IN$):J=B-
A:IFJ<1THEN50
•368 PRINT"{CD}DESTINATION BLOCK "
;:GOSUB5310:B=VAL(IN$):PRINT"{CD}
ENDING VOICE ";:GOSUB5310
•369 R=VAL(IN$):IFC=1THENQQ=6*4096
:GOTO191
•370 QQ=8*4096
•371 IFR=1THENR=6*4096:GOTO193
•372 R=8*4096
•373 FORI=QQ+A*3-3TOQQ+A*3-3+J*3+2
:POKER+B*3-3,PEEK(I):R=R+1:NEXT
•374 GOTO50
•375 IFA$<>"X"THEN377
•376 SYS5*4096+9*256+15*16+10:POKE
54296,0:P=0:PRINTQ$CHR$(9)"{CU}{C
U}":GOTO20000
•377 IFA$="S"THEN198
•390 IFA$<>"F"THEN2410
•391 PRINT"{SC}{CD}STARTING BLOCK
";:GOSUB5310:A=VAL(IN$):PRINT"{CD
}ENDING BLOCK ";:GOSUB5310
•392 B=VAL(IN$):B=B-A:IFB<1THEN50
•393 PRINT"{CD}VOICE ";:GOSUB5310:
C=VAL(IN$):IFC=1THENC=6*4096:GOTO
395
•394 C=8*4096
•395 QW=C:A=C+A*3-3:LO=12*4096+32-
1:C=1
•396 PRINT"{CD}MEMBER"C;:GOSUB5310
;:IFVAL(IN$)=0THEN2400
•397 IFVAL(IN$)<0ORVAL(IN$)>255THE
N396
•398 POKEC+LO,VAL(IN$):C=C+1:GOTO3
96
•400 A=O1%(J):RETURN
•402 IFLEFT$(A$,1)="R"THENA=0:GOTO
123
•403 PRINTQ$"IMPROPER NOTE !!":GOS
UB8000:GOTO50
•410 A=O2%(J):RETURN
•420 A=O3%(J):RETURN
```

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•422 IFA=9THENA=8
•423 RETURN
•424 IFF1<0THENPRINTQ$"ALL BLOCKS
 FULL FOR VOICE 1":GOSUB8000:GOTO4
 26
•425 GOTO50
•426 B1=B1-1:N=N-3:F1=F1+3:GOTO50
•430 A=04%(J):RETURN
•433 IFIN$="S"THENWV=33:RETURN
•434 IFIN$="N"THENWV=129:RETURN
•435 IFIN$<>"P"THEN439
•436 PRINT"{SC}{CD}LOW PULSE (0-25
 5) ? ";:GOSUB5310:A=VAL(IN$):PRIN
 T"{CD}HIGH PULSE (0-15) ? ";
•437 GOSUB5310:WV=65:B=VAL(IN$):IF
 A<0ORA>255THENA=127
•438 GOTO456
•439 WV=17:RETURN
•440 A=05%(J):RETURN
•450 A=06%(J):RETURN
•452 LO=VAL(IN$):IFLO<1ORLO>2730TH
 ENLO=1
•453 IFVV=2THEN455
•454 A=6*4096+(LO*3-3):POKEQQ+216,
 A-(INT(A/256))*256:POKEQQ+225,INT
 (A/256):RETURN
•455 A=8*4096+(LO*3-3):POKEQQ+221,
 A-(INT(A/256))*256:POKEQQ+229,INT
 (A/256):RETURN
•456 IFB<0ORB>15THENB=7
•457 IFA1=1THENPOKE54274,A:POKE542
 75,B:RETURN
•459 POKE54281,A:POKE54282,B:RETUR
 N
•460 A=07%(J):RETURN
•461 B$=RIGHT$(A$,2):IFLEFT$(B$,1)
 =" "ORA$="H"THEN134
•462 GOTO50
•470 A=08(J):RETURN
•471 B$=RIGHT$(A$,2):IFLEFT$(B$,1)
 =" "ORA$="S"THEN136
•472 POKEN+V1,2:POKEN+V1+1,0:GOTO1
 37
•473 IFIN$<>"TI"THEN166
•474 PRINT"{SC}{CD}{CD}CLOCK 1 EQU
 AL ";:GOSUB5310:IFVAL(IN$)=0THEN4
 80
•475 A=LEN(IN$):IFA>6ORIN$=""THEN1
 66
•476 IFA<>6THENFORI=1TO6-A:IN$="0"
 +IN$:NEXT
•477 TE=VAL(LEFT$(IN$,1))*16+VAL(M
 ID$(IN$,2,1))*16:IFTE<256THENPOKE
 56331,TE
•478 TE=VAL(MID$(IN$,4,1))+VAL(MID
 $(IN$,3,1))*16:IFTE<256THENPOKE56
•330,TE
 479 TE=VAL(RIGHT$(IN$,1))+VAL(MID
 $(IN$,5,1))*16:IFTE<256THENPOKE56
•329,TE:GOTO481
•480 FORI=56331TO56329STEP-1:POKEI
 ,0:NEXT
•481 PRINT"{SC}{CD}{CD}CLOCK 2 EQU
 AL ";:GOSUB5310:IFVAL(IN$)=0THEN4
 90
•482 A=LEN(IN$):IFA>6ORIN$=""THEN5
 0
•483 IFA<>6THENFORI=1TO6-A:IN$="0"
 +IN$:NEXT
•484 TE=VAL(LEFT$(IN$,1))*16+VAL(M
 ID$(IN$,2,1))*16:IFTE<256THENPOKE
 56587,TE
•485 TE=VAL(MID$(IN$,4,1))+VAL(MID
 $(IN$,3,1))*16:IFTE<256THENPOKE56
 586,TE
•486 TE=VAL(RIGHT$(IN$,1))+VAL(MID
 $(IN$,5,1))*16:POKE56585,TE:POKE5
 6584,0:POKE56328,0:GOTO50
•490 FORI=56587TO56584STEP-1:POKEI
 ,0:NEXT:POKE56328,0:GOTO50
•500 IFA$="V"THEN550
•505 IFA$="?"THEN49000
•510 IFA$<>"Z"THEN50
•511 PRINT"{SC}{CD}NEW SPEED ? ";:
 GOSUB5310:A=VAL(IN$):IFA<1ORA>255
 THEN50
•512 POKE56325,A:SP=A:GOTO50
•550 PRINT"{SC}{CD}{CD}FILTER VOIC
 E 1 ? (Y/N) ";:GOSUB5310:VW=0:IFL
 EFT$(IN$,1)="Y"THENVW=1
•552 PRINT"{CD}FILTER VOICE 2 ? (Y
 /N) ";:GOSUB5310:IFLEFT$(IN$,1)="
 Y"THENVW=VW+2
•556 PRINT"{CD}RESONANCE ? (0-15)
 ";:GOSUB5310:IN=INT(VAL(IN$)):IFI
 N<0ORIN>15THENIN=0
•558 POKE54295,VW+IN*16:PRINT"{SC}
 {CD}{CD}WANT HI-PASS FILTER ? (Y/
 N) ";:GOSUB5310
•560 VW=0:IFLEFT$(IN$,1)="Y"THENVW
 =64
•562 PRINT"{CD}WANT BAND-PASS FILT
 ER ? (Y/N) ";:GOSUB5310:IFLEFT$(I
 N$,1)="Y"THENVW=VW+32
•564 PRINT"{CD}WANT LOW-PASS FILTE
 R ? (Y/N) ";:GOSUB5310:IFLEFT$(IN
```

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$,1)="Y"THENVW=VW+16
•566 PRINT"{CD}WHAT VOLUME ? (0-15
) ";:GOSUB5310:IN=INT(VAL(IN$)):I
FIN<0ORIN>15THENIN=7
•568 IN=VW+IN:PRINT"{SC}{CD}{CD}WH
AT HIGH SETTING ? (0-15) ";:GOSUB
•5310:VW=INT(VAL(IN$))
•570 IFVW<0ORVW>15THENVW=0
•572 PRINT"{CD}WHAT LOW SETTING ?
(0-255) ";:GOSUB5310:VW=INT(VAL(I
N$))
•574 IFVW<0ORVW>255THENVW=0
•576 POKE54294,VW:POKE54296,IN:GOT
050
•1000 DATASS,S,SH,ES,E,EH,QS,Q,QH,
HS,H,HH,WS,W,WH,SIXTEENTH,EIGHTH,
QUARTER,HALF
•1001 DATAWHOLE
•1005 DATAC,C#,D,D#,E,F,F#,G,G#,A,
A#,B
•1007 DATAC,DB,D,EB,E,F,GB,G,AB,A,
BB,B
•1009 DATA6,7,8,14,15,16,30,31,32,
62,63,64,126,127,128
•1010 DATA268,284,301,318,337,358,
379,401,425,451,477,506
•1012 DATA536,568,602,637,675,716,
758,803,851,902,955,1012
•1014 DATA1072,1136,1204,1275,1351
,1432,1517,1607,1703,1804,1911,20
25
•1016 DATA2145,2273,2408,2551,2703
,2864,3034,3215,3406,3608,3823,40
50
•1018 DATA4291,4547,4817,5103,5407
,5728,6069,6430,6812,7217,7647,81
01
•1020 DATA8583,9094,9634,10207,108
14,11457,12139,12860,13625,14435,
15294,16203
•1022 DATA17167,18188,19269,20415,
21629,22915,24278,25721,27251,288
71,30588,32407
•1024 DATA34334,36376,38539,40830,
43258,45830,48556,51443,54502,577
43,61776,64814
•1200 DATA174,0,192,236,1,192,240,
7,232,142,0,192,76,59,89,160,0,14
0
•1201 DATA0,192,169,32,141,4,212,1
77,251,141,1,192,240,104,200,177,
251,141
•1202 DATA1,212,200,177,251,141,0,
212,24,165,251,105,3,133,251,144,
6,165
•1203 DATA252,105,0,133,252,174,2,
192,236,3,192,240,12,169,33,141,4
,212
•1204 DATA232,142,2,192,76,49,234,
160,0,140,2,192,169,32,141,11,212
,177
•1205 DATA253,141,3,192,240,68,200
,177,253,141,8,212,200,177,253,14
1,7,212
•1206 DATA169,33,141,4,212,169,33,
141,11,212,24,165,253,105,3,133,2
53,144
•1207 DATA6,165,254,105,0,133,254,
76,49,234,200,177,251,141,5,212,2
00,177
•1208 DATA251,141,6,212,24,165,251
,105,3,133,251,165,252,105,0,133,
252,76
•1209 DATA15,89,200,177,253,141,12
,212,200,177,253,141,13,212,24,16
5,253,105
•1210 DATA3,133,253,165,254,105,0,
133,254,76,79,89,169,0,141,0,192,
141
•1211 DATA1,192,141,2,192,141,3,19
2,168,153,0,212,200,192,2,208,248
,169
•1212 DATA0,234,133,251,169,0,133,
253,169,96,133,252,169,128,133,25
4,169,15
•1213 DATA141,24,212,120,169,0,141
,20,3,169,89,141,21,3,88,96,120,1
69
•1214 DATA49,141,20,3,169,234,141,
21,3,88,96,169,1,162,1,160,255,32
•1215 DATA186,255,173,5,192,162,6,
160,192,32,189,255,173,22,192,133
,249,173
•1216 DATA23,192,133,250,174,24,19
2,172,25,192,169,249,32,216,255,9
6,56,32
•1217 DATA240,255,142,48,192,140,4
9,192,96,24,172,49,192,174,48,192
,32,240
•1218 DATA255,96,169,0,160,3,153,8
,220,153,8,221,136,16,247,96,160,
7
•1219 DATA162,0,189,9,220,24,41,15
,105,48,153,19,4,24,189,9,220,74
•1220 DATA74,74,74,24,105,48,136,1
53,19,4,136,136,232,224,3,208,223
```

```
,173
•1221 DATA11,220,96,160,7,162,0,18
9,9,221,24,41,15,105,48,153,19,4
•1222 DATA24,189,9,221,74,74,74,74
,24,105,48,136,153,19,4,136,136,2
32
•1223 DATA224,3,208,223,173,8,221,
96
•1402 IFLEFT$(A$,1)="R"THENA=0:GOT
0303
•1403 PRINTQ$"IMPROPER NOTE !!":GO
SUB8000:GOTO50
•1424 IFF2<0THENPRINTQ$"ALL BLOCKS
 FULL FOR VOICE 1":GOSUB8000:GOTO
426
•1425 GOTO50
•1426 B2=B2-1:N2=N2-3:F2=F2+3:GOTO
50
•1461 B$=RIGHT$(A$,2):IFLEFT$(B$,1
)=" "ORA$="H"THEN314
•1462 GOTO50
•1471 B$=RIGHT$(A$,2):IFLEFT$(B$,1
)=" "ORA$="S"THEN316
•1472 POKEN2+V2,2:POKEN2+V2+1,0:GO
TO317
•1473 IFIN$<>"TI"THEN346
•1474 PRINT"{HM}{CD}{CD}CLOCK 1 EQ
UAL ";:GOSUB5310:IFVAL(IN$)=0THEN
480
•1475 A=LEN(IN$):IFA>6ORIN$=""THEN
346
•1476 GOTO476
•2400 C=C-1:PRINT"{CD}SEARCHING FO
R ";:FORI=1TOC:PRINTPEEK(LO+I);:N
EXT:PRINT
•2401 FORI=ATOA+B*3:FORJ=1TOC:IFPE
EK(I+J-1)=PEEK(LO+J)THENNEXT:GOTO
•2403
•2402 J=C+1:NEXT:GOTO2404
•2403 QQ=(INT((I-QW)/3))+1:PRINT"{
CD}BLOCK"QQ"POSITION"QQ*3-(INT((I
-QW)/(QQ*3))+1)
•2404 NEXT:PRINT"{CD}HIT A KEY TO
CONTINUE."
•2405 GETR$:IFR$=""THEN2405
•2406 GOTO50
•2410 IFA$<>"E"THEN500
•2411 PRINTQ$"WHAT POSITION ";:GOS
UB5310:A=VAL(IN$):PRINT"{CD}WHAT
VALUE ";:GOSUB5310
•2412 B=VAL(IN$):IFB>255ORA<0THEN5
0
•2413 POKE8*4096+A-1,B:GOTO50
•4000 D=1:PRINTQ$"DISK OR TAPE ? (
D/T) ";:GOSUB5310:IFLEFT$(IN$,1)=
"D"THEND=8
•4005 PRINTQ$"NAME OF FILE ?
    {CL}{CL}{CL}{CL}{CL}{CL}{CL}{C
L}";:GOSUB5310:QQ=1:LOADIN$,D,1
•5310 IN$=" ":L=1:ZD$=CHR$(20):CR$
=CHR$(13):W=646:I=1:G=15:N$="{WH}
{CL}":X=3:B$="ZQW*"
•5320 GETZ$:IFZ$<>""THEN5350
•5321 IFHTHEN5330
•5322 IFV=2THENQ=F1:F1=F2:TE=C1:C1
=C2
•5323 SYSSY:PRINT"{HM}BLOCKS FREE"
INT(F1/X)"{CR}{CR}{CR}{CR}:{CR}{C
R}:{CR}{CR}"
•5324 SYSYS:SYSC1
•5325 IFV=2THENF1=Q:C1=TE
•5330 POKEW,INT(RND(.)*G)+I:PRINTM
ID$(B$,L,I)N$;:L=(XANDL)+I:GOTO53
20
•5350 ZI=ASC(Z$):ZL=LEN(IN$):IF(ZI
AND127)<32THENPRINT" {CL}";:GOTO5
380
•5360 IFZL>15THEN5320
•5370 IN$=IN$+Z$:PRINTZ$;ZD$;Z$;
•5380 IFZI=13THENIN$=MID$(IN$,2):Y
$=LEFT$(IN$,1):PRINTCR$;:RETURN
•5390 IFZI=20ANDZL>1THENIN$=LEFT$(
IN$,ZL-1):PRINT"{CL}";:GOTO5320
•5400 IFZI=133THENZ$=CHR$(-20*(ZL>
1)):FORZI=2TOZL:PRINTZ$;:NEXTZI:G
OTO5310
•5410 GOTO5320
•7000 PRINT"{SC}{CD}COMPLETE COMMA
ND LISTING"
•7001 PRINT"######################
##"
•7002 PRINT"*S = SAVES A FILE TO D
ISK
•7003 PRINT"{CD}*L = LOADS A FILE
FROM DISK
•7004 PRINT"{CD}*G = GOTO A SPECIF
IED BLOCK (NOTE)
•7005 PRINT"{CD}*N = GOTO NEXT BLO
CK (NOTE)
•7006 PRINT"{CD}*B = GOTO PREVIOUS
 BLOCK (NOTE)
•7007 PRINT"{CD}*E = EDIT SPECIFIC
 SINGLE VALUE
•7008 PRINT"{CD}*C = ALTER ONE OF
MANY EDITOR VALUES
•7009 PRINT"{CD}  V = VOICE  T = T
```

```
EMPO  DSR = ADSR VALS"
7010 PRINT"{CD}  AU = AUTO DURATI
ONS  TI = SET TIME"
7011 PRINT"{CD}  FS = FASTER/SLOW
ER  X = BACK TO EDITOR"
7012 PRINT"{RV}HIT 'F1' TO CONTIN
UE...."
7013 GETR$:IFR$=""THEN7013
7014 IFR$<>"{F1}"THEN50
7015 PRINT"{SC}{CD}*? = DUMP MUSI
C LISTINGS TO PRINTER"
7017 PRINT"{CD}*P = PLAY ONE OR B
OTH VOICES"
7018 PRINT"{CD}*T = TRANSFER SECT
IONS OF MUSIC"
7019 PRINT"{CD}*F = FIND A CERTAI
N NUMBER OF VALUES"
7020 PRINT"{CD}*X = LEAVE PROGRAM
 AND SAVE ML
7021 PRINT"{CD}*H = COMMAND LISTI
NG
7022 PRINT"{CD}*V = CHANGE SID-CH
IP SETTINGS"
7023 PRINT"{CD}*S = CHANGE SPEED
SETTING"
7025 PRINT"{CD}ENTER OCTAVE, NOTE
, A SPACE, THEN
7026 PRINT"{CD}DURATION TO DIRECT
LY ENTER MUSIC.
7027 PRINT"{CD}USE A '*' ONLY FOR
 A COMMAND.
7028 PRINT"{CD}{RV}HIT A KEY TO C
ONTINUE.
7029 GETR$:IFR$=""THEN7029
7030 GOTO50
8000 FORI=1TO2500:NEXT:RETURN
10000 PRINT"{SC}{WH}{CD}{CD}{CD}{
CD}{CD}   C-64 INTERRUPT MUSIC MA
KER/EDITOR"
10002 PRINT"{CD}            VERSIO
N 1.09/01/83"
10003 PRINT"{CD}                BY
PETE LOBL"
10004 FORI=1TO1000:NEXT:POKE198,0
:RETURN
20000 PRINT"{SC}{CD}{CD}TAPE OR D
ISK ? (T/D) ";:GOSUB5310:DV=8:IFL
EFT$(IN$,1)="T"THENDV=1
20204 R=22784:QQ=23206:LO=12*4096
+22:POKELO+1,INT(R/256)
20205 POKELO,R-(INT(R/256))*256:P
OKELO+3,INT(QQ/256):POKELO+2,QQ-(
INT(QQ/256))*256
20206 PRINT"{CD}ML FILE NAME ? ";
:GOSUB5310:LO=LO-16:IFLEN(IN$)=0T
HEN20208
20207 FORI=1TOLEN(IN$):POKELO+I-1
,ASC(MID$(IN$,I,1)):NEXT:DV=1
20208 POKELO-1,LEN(IN$):IFLEN(IN$
)=0ANDDV=8THENPRINT"{CD}MISSING F
ILE NAME !!":GOTO20300
20209 POKE5*4096+10*256+10,DV:SYS
5*4096+10*256+7
20300 PRINT"{CD}{CD}TAKE IT EASY,
 HOPE YOU HAD FUN !!{CD}:END
49000 PRINT"{SC}{CD}{CD}WHAT VOIC
E ? (1/2) ";:GOSUB5310:IN=INT(VAL
(IN$)):IFIN<1ANDIN>2THEN50
49010 TV=IN:Z=6*4096:IFIN=2THENZ=
8*4096
49020 PRINT"{CD}STARTING BLOCK ?
";:GOSUB5310:IN=INT(VAL(IN$)):IFI
N<0ANDIN>1730THEN50
49030 BB=IN
49040 VI=3*IN:PRINT"{CD}ENDING BL
OCK ? ";:GOSUB5310:IN=INT(VAL(IN$
)):IFIN<0ANDIN>1730THEN50
49050 EB=IN:EN=3*IN+Z:Z=VI+Z:IFZ>
ENTHEN50
49100 OPEN4,4:PRINT#4,CHR$(10)"IN
TERRUPT MUSIC EDITOR PRINTOUT. (C
) 1983 PETE LOBL"
49200 PRINT#4,CHR$(10)"VOICE"TV"B
EGINNING BLOCK"BB"ENDING BLOCK"EB
49210 PRINT#4,CHR$(10)
50000 A=PEEK(Z):B=PEEK(Z+1):C=PEE
K(Z+2)
50020 PRINT#4,"BLOCK"BB;
50060 IFA=0THENPRINT#4,"AT/DEC ="
B"SUS/REL ="C:GOTO50100
50080 PRINT#4,"DURATION"A;
50081 J=B*256+C:FORI=1TO12:IFJ=01
%(I)THENA=1:B=I:GOTO50090
50082 IFJ=02%(I)THENA=2:B=I:GOTO5
0090
50083 IFJ=03%(I)THENA=3:B=I:GOTO5
0090
50084 IFJ=04%(I)THENA=4:B=I:GOTO5
0090
50085 IFJ=05%(I)THENA=5:B=I:GOTO5
0090
50086 IFJ=06%(I)THENA=6:B=I:GOTO5
0090
50087 IFJ=07%(I)THENA=7:B=I:GOTO5
0090
50088 IFJ=08(I)THENA=8:B=I:GOTO50
```

```
090
•50089 NEXT:IFJ>0THENPRINT#4," ? N
OTE":GOTO50100
•50090 I=13:IFJ=0THENPRINT#4," RES
T":GOTO50100
•50092 NEXT:PRINT#4,A;:IN$=NS$(B):
A$=NF$(B):IFA$=IN$THENPRINT#4,A$:
GOTO50100
•50094 PRINT#4,IN$" ("A$")"
•50100 BB=BB+1:IFBB>EBTHENPRINT#4,
CHR$(10)"PRINTING COMPLETE."CHR$(
10):CLOSE4:GOTO50
•50110 Z=Z+3:GOTO50000
```

DON'T CURSE THAT CURSOR!

From page 46

```
•0 REM...COMMODORE'S COLUMN #1 - R
UPERT-          8/21/83
•1 REM <<< LISTING >>>
•2 REM USE KERNAL ROUTINE 'PLOT'
        TO POSITION CURSOR
•3 PRINT CHR$(147)      :REM CLEAR S
CREEN
•4 REM STORE MACHINE LANGUAGE IN M
EMORY
•5 SA=49152          :REM STARTING AD
DRESS
•10 X=0
•20 READ B
•25 IF B=-1 THEN 110
•30 POKE SA+X,B
•40 X=X+1
•45 GOTO 20
•50 DATA 162,0,160,0,24,32,240,255
,96,-1
•100 REM -------------------------
-------
•105 REM...PUT CURSOR AT 1,10
•110 ROW=1:COL=10:GOSUB 1010
•120 PRINT"* HERE IT IS AT 1,10"
•125 REM...PUT CURSOR AT 20,15
•130 ROW=20:COL=15:GOSUB 1010
•140 PRINT"*NOW IT IS AT 20,15
•999 END
•1000 REM  ROUTINE TO PUT CURSOR A
T                  POSITION ROW,CO
L
•1005 REM  ROW = 0 TO 24 : COL = 0
 TO 39
•1010 IF ROW<0 OR ROW>24 THEN PRIN
T           "INVALID ROW":GOTO 1040
1015 IF COL<0 OR COL>39 THEN PRIN
T              "INVALID COL":GOTO 10
40
•1020 POKE SA+1,ROW:POKE SA+3,COL
•1030 SYS SA
•1040 RETURN
```

SEQUENTIAL FILES

From page 68

```
•10 CLR:DIMN$(100),P$(100):PRINTCH
R$(147)
•20 PRINT"      PHONE BOOK SEQUENTIA
L FILE DEMO"
•100 PRINT:PRINT:PRINT"START NEW F
ILE (Y/N)? ";
•110 GETA$:IFA$<>"Y"ANDA$<>"N"THEN
•110
•120 IFA$="N"THENPRINT"NO":GOTO200
•130 PRINT"YES":OPEN2,8,2,"@0:PHON
ES,S,W"
•140 PRINT#2,"0":CLOSE2
•200 OPEN2,8,2,"PHONES,S,R":INPUT#
2,N
•210 FORX=1TON:INPUT#2,2,N$(X),P$(
X):NEXT
•220 CLOSE2
•230 PRINT"{SC}";N;" ENTRIES EXIST
 IN FILE"
•300 PRINT:PRINT"1- ADD ENTRIES"
•310 PRINT"2- DELETE ENTRIES"
•320 PRINT"3- DISPLAY LIST"
•330 PRINT"4- SEARCH FOR NAME"
•340 PRINT"5- EXIT PROGRAM"
•350 PRINT:PRINT"ENTER CHOICE: ";
•360 GETA$:A=VAL(A$):IFA<1ORA>5THE
N360
•370 IFA=1THEN400
•375 IFA=2THEN450
•380 IFA=3THEN500
•385 IFA=4THEN550
•390 IFA=5THEN600
•400 PRINTCHR$(147);"ENTER NAME, P
HONE NUMBER:":N$="":P$="":INPUTN$
,P$
•410 IFN$=""THEN230
•420 N=N+1:N$(N)=N$:P$(N)=P$:GOTO2
30
•450 PRINTCHR$(147);"ENTER NAME TO
 DELETE:":N$="":INPUTN$:IFN$:IFN$
```

```
=""THEN230
•460 F=0:FORX=1TON:IFN$=N$(X)THENF
=X
•470 NEXT:IFF<>0THEN480
•472 PRINT"NOT FOUND.  HIT A KEY."
•475 GETA$:IFA$=""THEN475
•477 GOTO230
•480 N=N-1:FORX=FTON:N$(X)=N$(X+1)
:P$(X)=P$(X+1):NEXT
•490 GOTO230
•500 PRINTCHR$(147)
•510 FORX=1TON:PRINTN$(X),P$(X):NE
XT:PRINT:PRINT"ALL DONE.  HIT A K
EY."
•520 GETA$:IFA$=""THEN520
•530 GOTO230
•550 PRINTCHR$(147);"ENTER NAME TO
 SEARCH FOR:":N$="":INPUTN$:IFN$=
""THEN230
•560 F=0:FORX=1TON:IFN$=N$(X)THENF
=X
•565 NEXT
•570 IFF<>0THEN580
•575 PRINT"NOT FOUND.  HIT A KEY."
•577 GETA$:IFA$=""THEN577
•578 GOTO230
•580 PRINTN$(F),P$(F):PRINT:PRINT"
HIT A KEY."
•585 GETA$:IFA$=""THEN585
•590 GOTO230
•600 OPEN2,8,2,"@0:PHONES,SW":PRIN
T#2,N
•610 FORX=1TON:PRINT#2,N$(X):PRINT
#2,P$(X):NEXT:CLOSE2
```

PEANUT

Continued from page 41

The software needed to run the printer was delivered late to the Federal Communications Commission, delaying approval. Compatible software is as yet nonexistent; and other than the programs Coleco has promised to release simultaneously with the computer, no one has committed themselves to producing any.

Coleco's delay in breathing life into Adam will cost them sales. In June, they set an August release date. In August they said September. It is early October at press time and still no Adam. Each month Coleco misses, analysts say, could mean 100,000 lost sales. They could even miss the 1983 Christmas season, which would cause inestimable losses.

Also mitigating against Coleco is their image as a manufacturer of toys, albeit exceptionally innovative ones. This is the identical problem Mattel faces with the fielding of their Aquarius home computer, and it remains to be seen how much either company's proved marketing skill can do to overcome its image.

Early indications were that Adam would be a runaway best seller, but all these factors should combine to keep buyers away in droves. The system may still be profitable, even very profitable, but there is no reason to think that Adam will topple the C-64 from the catbird seat.

While Adam will have to prove or disprove itself in the marketplace, the success of the C-64 is already established. That of the Peanut is as good as established. It may well happen, as some analysts believe, that these two machines end up the Hertz and Avis of the home computer industry with no other manufacturer posting better than a distant third. Which will be number one and which will try harder is impossible to say; it is impossible even to predict until IBM puts the Peanut's cards on the table.

But it can safely be stated that, as the home computer market continues to grow and the number of participants in the field continues to shrink, the two giants will have plenty of ground to straddle in years to come. □

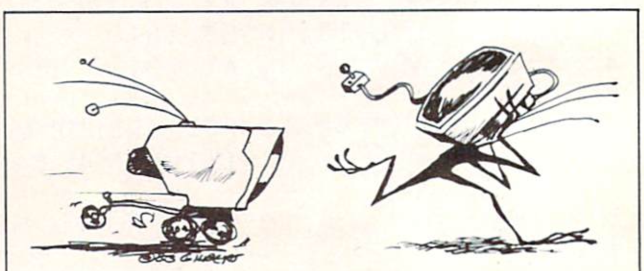
MULTI-DRAW

Continued from page 38

different values into that location (0-255). You will notice that the window will get larger with smaller numbers poked in. The technique that allows this will also make it possible to have more than eight sprites on the screen at once, or multi-color and standard color at the same time. You could even bit map the entire screen with sprites!!

Next month I talk about each ML routine separately, and I add 10 more commands, forming an excellent graphics package. These commands include DRAWTO, FILL, CIRCLE, etc.

Program Listing, page *74*.





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2

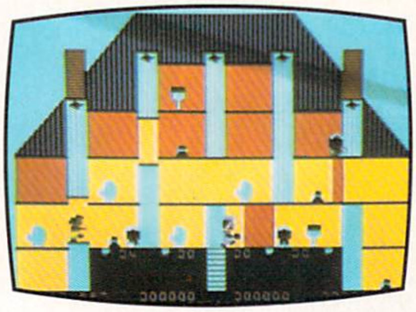
SCUTTLEBUTT

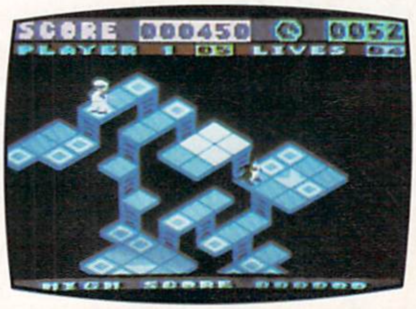
GAME ROUND-UP

While computer games seem to be coming out at assembly line speed, First Star has put the assembly line onscreen with *Panic Button.* Pieces of various products (robots, cakes, TVs, telephones) roll off a three-tiered conveyor belt, to be assembled by you. True to the silent screen tradition, the pace will progressively quicken. Completed objects roll offscreen into the shipping department, adding to your score; parts you miss fall to the floor, and in the later levels, bounce back up and fly around the factory. Hitting the "panic button" freezes the action for a few seconds, until the angry boss turns the conveyor belt back on. An 8K program designed for the Vic-20, the $24.95 cassette was scheduled for September release; the $34.95 cartridge, for November.

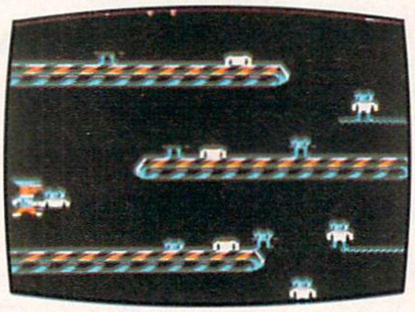
If your assembly line experience leaves you longing for another brush with manual labor, First Star's *Bristles* will put you in the spattered shoes of a housepainter. You'll ride elevators from floor to floor in a frantic effort to paint eight different dwellings, while watching for the Smart Bucket, the Dumb Buckets, the Flying Half-Pints, and the super's daughter, who puts her handprints on the wet paint. One to four players can choose to be any of eight characters, each of whom has his own theme music. For the C-64, the disk and cassette (both $29.95) are scheduled for November release, the cartridge ($34.95) for December.

First Star's third new entry in the Commodore market is *Flip and Flop.* You begin as a kangaroo, newly escaped from the zoo, hopping along a tiled maze to escape the pursuing zookeeper and to rejoin your friends in the circus. In alternate levels, the









Top to bottom: **Bristles, Flip and Flop** ***(middle two),*** **Panic Button.**

playfield turns upside down and you become a monkey hanging from the bottom of the maze, swinging from square to square. The game features thirty-six levels of play, expanding and scrolling playfield, six animations, and demonstration mode. Disk and cassette ($29.95) will be available in November, cartridge ($34.95) in December, all for the C-64.

Included among Imagic's June 1983 crop of computer games were five either designed for, or translated for, the VIC-20.

The 3D graphics of *Moonsweeper* pit the player against meteors and enemy spacecraft as (s)he tries to rescue miners trapped on the moons of Jupiter.

Described by Imagic as "exceptionally colorful and fluid," *Fathom* embroils the gamer in a sea myth of dolphins, mermaids, and Neptune's trident. Rob Fulop, creator of *Demon Attack,* concept-designed the Atari VCS version.

Flap! turns the videogamer into a fireball-spewing dragon that must fend off the enemies attacking it and its nest of eggs.

In *Nova Blast,* players' ships duel in the skies above the four domed cities they are trying to protect.

To defend *Atlantis,* the player must fire from multiple points at the invaders of the fabled underwater city.

Computergamers who long to take a creative role in the games they play will be in the chips with *In the Chips,* a VIC-20 cartridge scheduled for October release. It's the third in Creative Software's series of "concept educational programs," founded upon the premise, says marketing veep Elliott Dahan, that "An educational software program need not be limited to drill and practice or courseware in order to be an effective learning tool."

One or two players operate rival software companies and, with $100,000 each to finance operations, try to out-profit the competition. Using the joystick, each player sends an assistant to buildings where he will make decisions on product develop-

ment, inventory, pricing, and advertising. When all these decisions are made, players see their financial results for the quarter and make future inventory, pricing, and budgeting decisions.

Suggested retail price for the cartridge is $29.95.

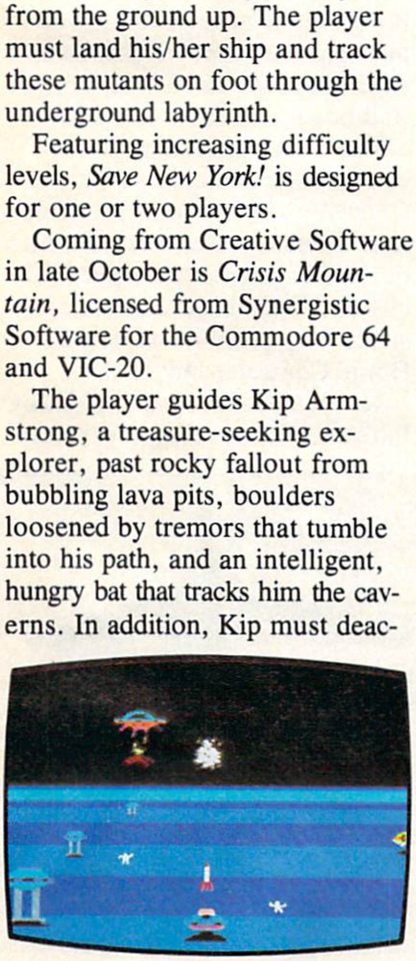
Defending the Big Apple from munching monsters is the computergamer's goal in *Save New York!*, a Creative Software creation for the Commodore 64.

The player pilots a rocketship from which (s)he fires on outer space creatures lunching on real estate, while avoiding the dual dangers of running out of fuel and crashing into buildings. The aliens also lay eggs that hatch into baby mutants, who crawl into the subway and begin eating the city from the ground up. The player must land his/her ship and track these mutants on foot through the underground labyrinth.

Featuring increasing difficulty levels, *Save New York!* is designed for one or two players.

Coming from Creative Software in late October is *Crisis Mountain*, licensed from Synergistic Software for the Commodore 64 and VIC-20.

The player guides Kip Armstrong, a treasure-seeking explorer, past rocky fallout from bubbling lava pits, boulders loosened by tremors that tumble into his path, and an intelligent, hungry bat that tracks him the caverns. In addition, Kip must deactivate two time-bombs ticking away in remote caves before they blow up the mountain.



Imagic's Moonswseeper.

With each injury Kip sustains, his strength levels decrease, from three to two to one to zero. At two he walks slowly, at one he crawls, and at zero he loses his life (of which he receives three per game).

Kip scores points by collecting treasure, with the object of moving onto a more dangerous and more treasure-laden mountain. Why? Because it's there.

Crisis Mountain will have a suggested retail price of $34.95 for the Commodore 64 cartridge and $29.95 for the VIC-20.

The success of the film "War Games," in which a teenager's contest with a defense department computer brings America and Russia to the brink of World War III, made it inevitable that a game based on the movie would soon be produced. Thorn Emi Video has done just that with *Computer War*, compatible with the VIC-20.

While alarm bells sound, the main computer in the control center of NORAD (North American Air Defense System) signals a nuclear attack coming—but not from the USSR. The player must crack the computer code and destroy the missiles that will otherwise destroy the world.

Scheduled to be available at press time, the game will retail for $39.95.

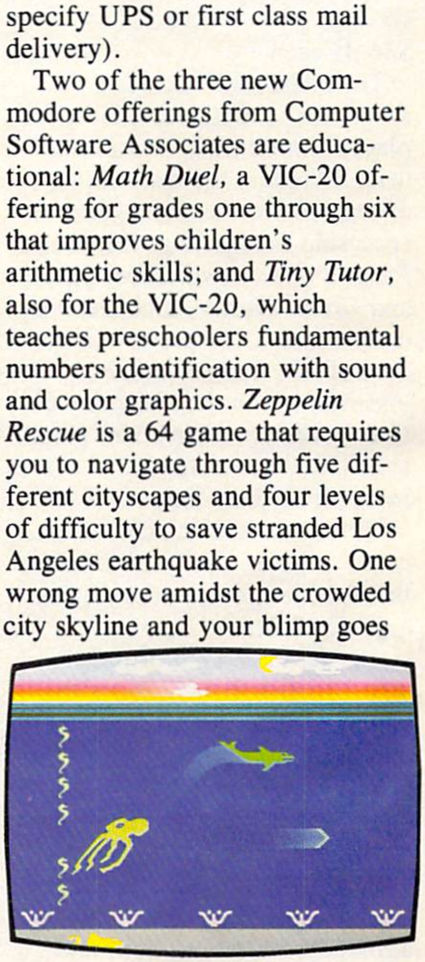
You can put your joystick to the use it was designed for in *Night Mission Pinball*, a SubLogic program for the C-64 that is based on a World War II bombing run. The game recreates an actual pinball table, with five bumpers, seven standup targets, nine rollovers, and two spinners.

Realistic sound effects will accompany you as you maneuver your ball down the bomb release line. Four standup targets control the bonus multiplier. A hole kicker can catch your ball, activating a number of bonus features before ejecting the ball into play. Up to four balls can remain in play at once.

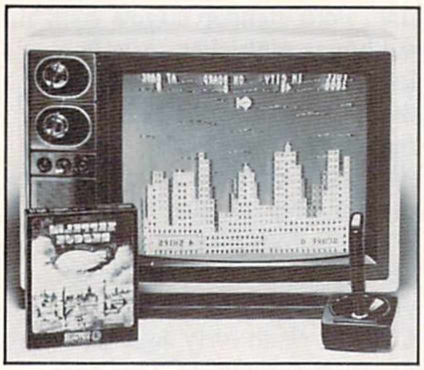
One to four players can compete at a time, in ten modes of play ranging from Competition to Cosmic. With forty adjustable program parameters, you may create custom games or redesign play modes.

Joysticks are recommended, but keyboard control is available. The program can be ordered direct from SubLogic Corporation, 713 Edgebrook Drive, Champaign, IL 61820. Available on disk or cassette, the price is $29.95 (add $1.50 for direct orders and specify UPS or first class mail delivery).

Two of the three new Commodore offerings from Computer Software Associates are educational: *Math Duel*, a VIC-20 offering for grades one through six that improves children's arithmetic skills; and *Tiny Tutor*, also for the VIC-20, which teaches preschoolers fundamental numbers identification with sound and color graphics. *Zeppelin Rescue* is a 64 game that requires you to navigate through five different cityscapes and four levels of difficulty to save stranded Los Angeles earthquake victims. One wrong move amidst the crowded city skyline and your blimp goes



Imagic's Fathom.



Zeppelin Rescue.

blooey, killing you and the people you're trying to save. Price is $19.95 for cassette and $24.95 for disk.

In line with its plan to produce all new Commodore 64 software on 5¼" flopy diskettes, United Microware Industries has released six such games, retailing at $34.95 each.

The latest litter includes *Renaissance,* with eight levels of play; *Pennant Drive,* featuring team diskettes; the fast-driving *Motor Mania; Fuego,* a game of spaceship firefighting; *Word-Feud,* a one or two player game; and *Grand Master,* a challenging chess contest. All are joystick-controlled (*Word Feud:* 2 joysticks), with the exception of *Grand Master,* a keyboard game, and all are scheduled to have been released by press time.

UMI states that it plans new 64 game software designed to utilize the diskette memory potential as high as 100K.

For the same kind of people who thumbed their noses at the advent of television, favoring old-time radio for the imaginative input it required, Infocom took a technological step backward in the creation of their Interlogic series. These totally textual prose adventures require the player to use imagination, reasoning, wit, and memory, while giving commands



Paint Master.

in complete English sentences from a six hundred word vocabulary. Following the favorable reviews for *Zork* (numbers I,II, and III), *Deadline,* and *Starcross,* three more Interlogic games have seen release.

Suspended awakens the player from cryogenic freeze to a world in crisis. (S)he must manipulate six robots, each with its own particular quirk or problem, to overcome a series of complex difficulties. (Reviewed in this issue.)

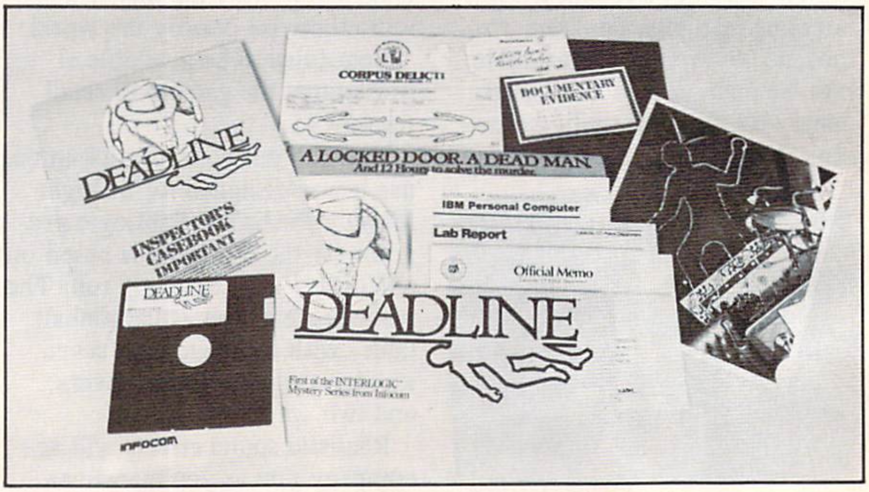
In *The Witness,* the gamer is exactly that, plus detective, suspect, and potential victim. Included are such physical clues as a period newspaper and a suicide note.

Planetfall is a comic adventure that strands the player on a hostile world, with only a scrub brush and an eccentric robot companion. (S)he must prevent the planet from falling into the sun while finding food, sleeping, getting sick, and even dreaming.

The games, which require disk drive, are available for all major home computers, including the C-64.

Atari Inc. has begun marketing software for several of its competitors' microcomputers, including the C-64 and VIC-20. The company plans a line of educational, home management, computergame and personal development software, to be sold through traditional consumer electronics outlets. ''We plan to make the best popular game titles, such as *Defender* and *Pac-Man* available to consumers, regardless of which home computer they've purchased,'' says Keith Schaefer, senior vice president of Atari's Home Computer Division.

Newly released for the C-64 by Parker Brothers are *Q*Bert* (the



***Hard-boiled hacking with Infocom's* Deadline.**

lovable, hopping whatzit), *Frogger* (cross the highway without getting stomped), *Super Cobra* (dodge fireballs as you snake your jet through the city), *Popeye* (save the one-eyed swabby from Bluto and the Sea Hag), and *Astro Chase* (just what the name implies).

Datamost's *Paint Wizard* will improve the quality of life for future generations of kids, by insuring that none of them will get a beating for drawing with crayons on the TV screen. This graphics package will allow kids of all ages to do just that with a VIC-20.

Using any size paint brush (s)he chooses, the viewer can draw straight lines and circles in different colors, and repeat patterns to create computer works of art or totally original designs. Available in cartridge and diskette, the price is $49.95.

Fox Video Games, created last year by 20th Century-Fox to produce videogames based on characters and plots from their TV shows and movies, will start shipping computer software on its own this fall.

The first three titles include *M*A*S*H,* previously distributed for Fox by Texas Instruments, *Porky's,* and *Revenge of the Beefsteak Tomatoes,* all for the VIC-20. C-64 and PET versions will follow. Future plans include *M*A*S*H II,* a game based on the Fall Guy TV series, and an undisclosed, movie-based educational game for the PET.

For the VIC-20 from CBS Electronics: *K-Razy Antics* (multilevel maze chase with an ant motif) and *K-Star Patrol* (space battle with the dreaded Intergalactic Leech).

Though it has yet to produce its first game for the Commodore computers, Electronic Artists rates a mention here. Trip Hawkins, the company's 29-year-old president, has developed a creative structure certain to produce some of the outstanding entries in the field in years to come. He has hired producers to seek out and sign software designers to create games on a royalty basis. He is allowing designers to work out of their homes, anywhere in the country. And he is investing in software tool technologies such as the compiler, which essentially translates codes that are easy for the artists to use into a computer's own assembly language.

Electronic Artists will introduce about twenty-five titles this year for the Atari and/or Apple computers. Their most notable effort to date is a basketball game based on a taping of a one-on-one match between super pros Julius Erving and Larry Bird. Such factors as fatigue, hot streaks, and shooting percentage from different parts of the court are taken into account. Larry Bird, for example, will be a superior outside shooter, but only Dr. J will be capable of his famed leap-and-dunk from the foul line.

Laserdisc Futures

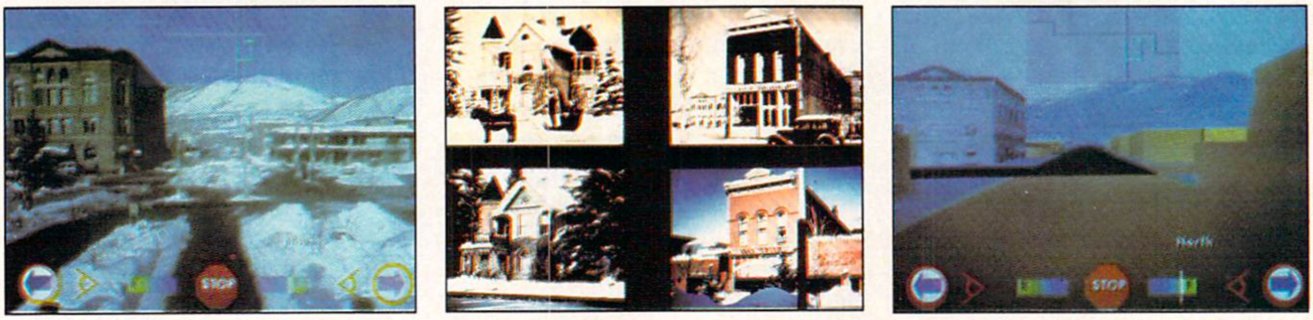
Arcade players are lining up to plunge battleaxe first into *Dragon's Lair,* the first fully animated game using a high resolution laserdisc. Even at 50¢ a crack, the new entry has generated a fanatical following everywhere it's appeared. Such success is not surprising for a game which is visually comparable to a professionally animated film—and which has the advantage of allowing the viewer to determine the story's outcome.

But as fascinationg as laserdisc technology is on the videogame screen, its present and future applications to home computer users are more fascinating still. Owners of the Commodore 64 and other systems may someday be able to, not only play interactive laserdisc games with incredibly fast and complex access, but also put information onto a blank disc. The technology exists. Thus far, so do high prices.

A videodisc is a thirty-centimeter wide plastic disc con-



Dirk of Dragon's Lair *has blazed a bumbling laserdisc trail.*



The Aspen Map ***(photos courtesy of Andy Lippmann and the Architecture Machine Group at M.I.T.***

taining 54,000 data tracks on each side. The tracks are arranged in a continuous spiral; the information proceeds from the inner circumference of the disc toward the border. Each data track represents one frame of action.

Etched in the surface of each data track are numerous microscopic depressions, or pits. A laser beam passes over the disc, reads the digital information contained in the depressions, and passes it on to a complex of beam splitters and mirrors, plates, grates, lenses, and much more before reaching the screen.

The surface of the disc is coated with aluminum oxide and a thin plastic—enough to make it almost indestructible in normal usage. You can sit on it, hold it with greasy fingers, or spill a drink on it without damage. No matter how many times you play the disc, its sound and color will remain brilliant. Lack of friction with anything (including the laser beam arm) allows freeze frames to be held indefinitely. Slow and rapid scanning is also possible, with the speed at which any one frame can be reached limited only by the controlling mechanism.

Any laserdisc player with an RS 232C port can be hooked up to a computer, giving the player the same capability as laserdisc games in arcades. By now, says John Messerschmitt of North American Phillips (manufacturer of the Magnavox and Sylvania brands of videodisc player), every major company in the field will have developed at least two games. ''We believe that arcade games will be moving into the home because of the video interactive laser system with instant access,'' Messerschmitt says. In fact, Coleco has already purchased the home distribution rights to *Dragon's Lair* for $2 million.

But far from simply bringing the latest arcade graphics into the home, laserdisc will provide many other entertainment and educational functions for personal computer owners.

Perhaps the most original entry in the entertainment category is the Mystery Disc series from Vidmax. Both disc # 1 *(Murder, Anyone?)* and # 2 *(Many Roads to Murder)* provide the player with a set of characters with complex personalities and motives. While the characters, and their relationships to one another, remain pretty much the same, depending on what direction the player takes there will be different murders, different victims, different motives, and totally different situations. In *Many Roads to Murder,* for example, plots may center around espionage, patent theft, drugs, or money. Through such clues as photos, newspaper clips, diary excerpts, textual interviews, flashbacks, and closeups of key objects, the player must determine three elements: the murderer, the method, and the motive. Rapid reflexes are not a factor; the accent is on cerebral workmanship.

Moving to the still more cerebral, North American Phillips is offering *Vincent Van Gogh: A Portrait in Two Parts.* Leonard Nimoy narrates and appears in the two-track disc, which includes a play about the artist's life and two hundred of his works which can be readily accessed.

From Optical Programming Associates comes a variety of interactive laserdiscs, including *The Joy of Relaxation,* a complete clinically tested program including a questionnaire to help the viewer determine his/her stress limit. The program includes two soundtracks, one simple and one more detailed. The educational quiz game *History Disquiz,* hosted by Steve Allen, utilizes newsreel footage of 20th-century events. Subjects include sports, movies, personalities, music, politics, and more. *Maze Mania* consists of four maze games, requiring players to answer questions and navigate dead ends, detours, and other obstacles. *The World of Martial Arts* offers entertainment and two different levels of instruction.

Of all the laserdisc achievements, perhaps the most technically polished and ingenious one is the Aspen Map developed

by MIT's Architecture Machine Group, under the supervision of Andrew Lippman. The venture was funded by the Advanced Research Projects Agency, an arm of the Defense Department. During the time of the Israeli raid on the Entebbe Airport, the military wondered if there were some way to train troops to move around quickly to a location without previously visiting that location.

Says Dave Backer: "The crew had a truck with cameras and actually drove up and down all the streets of Aspen, shooting a frame every ten feet. We also animated the entire town. Walter Bender, a staff person in the lab, had a 3D animation program. He used a data base to draw in some blocklike builings; we then digitized photographic detail and then sort of billboarded it onto the side of the buildings in perspective. It is a block representation but certain landmarks have photographic detail."

The result is an electronic map of the city, or a surrogate travel system. The user can hover over the city, select an intersection and zoom in on the intersection, then "drive" through the streets. A schematic map or a detail map can be summoned, and the user can choose to visit Aspen in either fall or winter.

Commercial uses of the technology include demonstrating geographical areas to travel or real estate clients. MIT, however, had other applications in mind. "We were more interested in using the same kinds of techniques to navigate in other kinds of spaces," says Dave Backer. "How about taking a drive through the human body? We were trying to develop spatial ways of working through large bodies of information. Aspen was the project we chose; we've done that and now are through with it." Though MIT has moved on, other companies are developing surrogate travel systems.

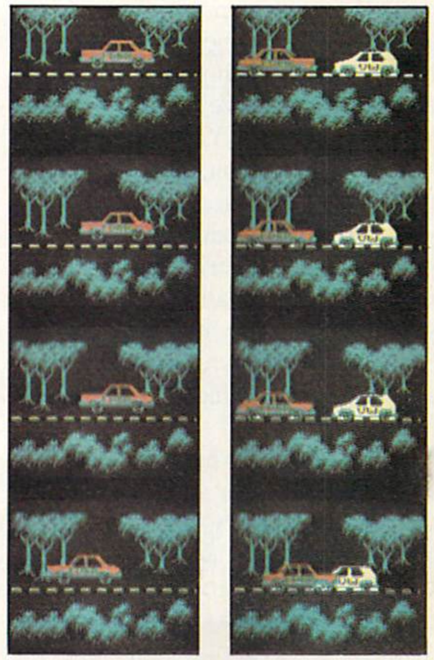
As to the future of laserdisc technology and its impending marriage to home computers, Dave Backer has a few thoughts: "You will be able to lay out information on the disc and have a data base that allows you to access it; faster, more precise access at that. It also gives you the possibility of dynamically editing material together from a videodisc. Instead of sitting there passively watching a presentation, you could react with computer generated controls; you could tailor the presentation to your own interests. Mix live video with still frames. The movie that you would see would be different from the one I would see.

"The discs that are out now are read-only. They're coming out with erasable, writable discs now on an industrial level. It will be a while before they're available on a consumer level. When they become affordable, you could get discs with material on them with blanks that you could fill in with your own material: personalize it, update it with your own CCD camera."

These are 'only a matter of time' type speculations. But with fever over the arcade laserdisc games running wild, wilder speculations are engendered.

CHARACTERS IN SEARCH OF A USER

"Our feeling is that the day of *Space Invaders* is dead," says Guy Nouri of *Interactive Picture Systems* in New York. "In the future, computer programs will not be so much shoot-em-ups, but activities. Learning software, not educational, but learning."



Great Marketing Wars of the 80s ***was animated by Mary Beams on IPS'*** **Movie Maker.**

Nouri's IPS has taken a first step in that direction with *The Movie Maker,* which will soon be on the market for the Commodore 64.

The Movie Maker is a real-time animation system that requires absolutely no programming. "It's designed to be as simple as possible to use," says Nouri. "Everything takes one or two key strokes."

The process is divided into four parts, each an individual program: compose, record, smooth, and play.

"Compose is the process in which you draw what is traditionally known as animation cels," says Nouri. "We supply characters with the disk or you can create your own. You might draw a little man, put him down, pick him up, change him slightly, put that down, change it slightly and so on until you've put together a walking sequence.

"The next step is to record. You

go to the main menu, hit record, and the record program is loaded in. The shapes that you have composed are still there, intact, backgrounds too. You simply hit 'A1' ('A' for action, '1', signifies the actor you are recording). Now you move him around with the joystick, get the feel of it (you're rehearsing essentially). When you're ready, you hit the space bar, and as you move your figure around, the movement is recorded.''

After viewing what (s)he has done, the animator can now repeat the process, adding, for example, a dog to run alongside the man. Up to six actors can be recorded in real time (the joystick process described above, play as it records) or one frame at a time.

In addition, the system contains full editing capability (rewind, fast forward, single frame step) and innumerable image processing functions: any of the Commodore colors can be changed or inserted; screen sections can be moved, framed, duplicated, or mirrored. The animator can zoom in three levels. The illusion of panning is achieved by zooming on a closeup of the sequence's background. Any given frame can be erased, an actor's position changed, or an actor can be yanked entirely.

The Movie Maker also takes full advantage of Commodore's sound chips. Musical notes, continuous sounds or melodies as well as sound effects are possible. Guy Nouri lists some of the sounds developed for *The Movie Maker:* ''Clarinet, whistles, train sounds, zaps, zooms, and drums. It gets kind of wild, especially when you get all four going at the same time.''

Smooth is the process by which the animator compiles the animation, the background, and the sounds. All the data is condensed into a single file. The final process, play, is as if the file were a film and the computer a projector. But of course the process can be easily viewed as it develops.

Once an animation is completed, new sounds can be added or new characters, following the preprogrammed choreography, can be easily inserted.

''It's very flexible,'' says Nouri. ''The system is built to be open-ended. There's an X key, an extra function. There's room in the program so that you can add special effects and so on. We went overboard on it. we wanted to build a landmark.''

Besides the obvious leisure applications of the system, businesses can employ *The Movie Maker* to animate a trend, a process, or demonstrate the functions of new machinery. IPS has also developed *The Movie Maker Professional,* which has increased resolution and can handle up to sixteen characters. Several software developers have already licensed the system so that they can create animation for future games without coding them up, a process which normally takes several months with no guarantee that the results will be worthwhile.

And what future products does IPS have in development for the post-*Space Invaders* age? Guy Nouri reveals that they are working on a dance program, one which already contains a library of dance steps from which the user can select to arrange a sequence.

Graphics programs obviously have virtually endless possibilities. What about a program for interior decor—combining furniture, wallpaper, and carpets of different styles and colors? Or an architectural program for designing houses and skyscrapers? It's a future for which we can't help but . . . paint a rosy picture!

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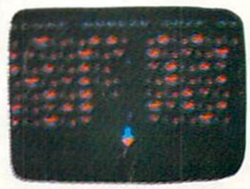
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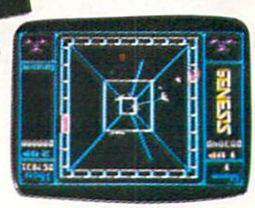
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